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EDITORIALS

Chemically Prepared

WITH the newspapers full of accounts of the Sino-Japanese difficulties, American business men and Americans in general have more cause than ever to be thankful that certain national leaders have insisted upon a self-contained American chemical industry. Apparently we cannot depend upon open trade routes in a permanently peaceful world.

War in the present instance seems unthinkable as far as the United States is concerned, but the situation illustrates the ever-present danger. The outlawing of war is a noble ideal, but one quite hopeless of realization. No nation will be bound by a pact when its national existence is threatened; and no larger nation will make a real gesture toward enforcing a pact unless the national self-interest is involved. Mr. Howard Brubaker pointed out in the *New Yorker* the absurdity of the situation when he said that the United States might go to war to establish the principle that war ought to be renounced as an instrument of national policy.

We see possibilities of trouble not in the East alone. Every fresh disturbance in Europe is a new reminder that America must keep on hand enough chemically trained men and enough chemical equipment to provide for the maintenance of all the branches of American industry even under the special schedules of war times.

In spite of negotiations at Geneva, it seems fairly certain that one of these war-time necessities will be poison gas. It has been illustrated too many times in the past that a desperate nation will turn to any weapon that is available. In the particular case of poison gas, the choice happens to fall upon a humane weapon rather than upon a cruel one. Figures comparing the casualties inflicted by gas with those inflicted by other military weapons show clearly where the real barbarity lies.

The real advantage of gas as a weapon lies, however, in the fact that its preparation and the training of a personnel equipped to handle it involve no such purely wasteful expenditure of national resources as the building of, say, a battleship. Chemical plants and trained chemists usually support themselves in time of peace, as an army and battleships

do not. Chemistry adds to the wealth of the country, instead of using up wealth produced by other means.

In some ways this constitutes a disadvantage. It is harder to make a nation see the necessity for partial support of a chemical weapon, by tariff protection, than it is to make the nation assume the entire burden of supporting a military establishment.

If the nation pays a billion dollars for a navy, the nation considers it money well spent. If the country is forced, through a tariff on chemicals, to support an equally important arm of the national defense, there is acrimonious contention in the Senate.

Fortunately there have been Americans who were willing to fight for adequate chemical protection for the country. The Far East may become a menace, just as Europe may become a menace. It is a satisfaction to realize that the chemists of this country are a little better equipped than they were the last time, and that the United States is no longer dependent upon a foreign nation for necessary chemicals.

The Medalist

THE award of the medal of the American Institute of Chemists to Dr. Charles H. Herty is particularly appropriate, coming as it does, just when his important work on the development of newsprint from slash pine is nearing completion.

In undertaking this work, Dr. Herty had to face a mass of popular opinion that discouraged his project. Everyone knew that the slash pine, like most of the southern pines, produced resinous substances which would certainly prevent the manufacture of white paper. It required a chemist like Dr. Herty to attack the problem experimentally and to establish in the laboratory the fact that resinous substances are a pathological product in the tree, and that the young trees are free from material inimical to paper manufacture.

Logically, our pulpwood ought to be produced under the semi-tropical conditions of the South, where year-round sunshine produces cellulose three times as fast as it is produced in the forests of Quebec. Dr. Herty has carried a logical idea to the stage of actual practice, a step that in many, many cases is never accomplished.

It is by such pieces of research that chemists are benefiting the world. We like Dr. Herty as medalist perhaps even more for this work than for his more nationally important work as president of the American Chemical Society and as editor of *Industrial and Engineering Chemistry*. He illustrates the fact that a chemist, working in a laboratory, can increase

the national wealth by millions of dollars. He is also an example of the executive who benefits his profession and his country by using his executive talents to bring about welfare.

We feel a slight touch of additional satisfaction about the award because Dr. Herty is a Fellow of the American Institute of Chemists, the first medalist to be chosen from among our own members. In selecting a chemist for the same honor that has been bestowed on such public benefactors as the philanthropists who established the Mellon Institute and the Chemical Foundation, we feel that the jury on medal award has acted wisely.

Too Much for Research?

THE New York *Times* quotes Dr. E. E. Free, science lecturer at New York University, as saying that American universities have "ten times as much money for scientific research as is good for them, and need specialization much more than they need endowments.

"Funds for scientific research could be reduced at least 75% without any harm. The whole activity of scientific research is grossly exaggerated."

Doctor Free goes on to say that each university should specialize in one thing—Harvard on the classics, Princeton on literature, Chicago on medicine, Cornell on agriculture, and so on. He also makes the point that if scientific budgets were reduced it would force better planning.

Doctor Free seems to have lost his sense of perspective, and seems to have no concept at all of the fundamental purpose of education. The intelligent thinkers of the country are realizing the need for more and more scientific research. Doctor Free stands opposed to the idea on rather remarkable grounds. If the money being spent on scientific research is being spent unwisely, the solution is not to reduce appropriations, thus putting the problem in the hands of still less competent people and resulting in still greater futility of effort. Might it not be better to emphasize research to the point where the great executive minds of the country are willing to see that it is efficiently carried out?

Doctor Free's additional fetich of specialization is a good idea provided that (*a*) man was made for education and not education for man, and (*b*) specialization would really further the advance of science.

Specialization is a fine-sounding word and has had a valuable influence in many human activities. That it is an inevitable cure for all ills, is less certain.

New Paths in Chemistry

By Chandler D. Ingersoll

How the field of the chemist's work has increased. The scientist in world affairs. A discussion of the particular field of advertising.

NO BETTER picture of the surge of chemistry into the forefront of human endeavor can be gained than by a comparison of the crude, rough surroundings of the alchemists with the present position of leading chemists in commercial, national, and world affairs. The interesting series of prints being brought out by *The Percolator* (The Chemists' Club, New York City) shows clearly the uncouth nature of these ancient "smithies of the atom." You need only step into any modern chemical laboratory or office to realize the difference between the ancient and modern chemist. The horizon of the chemist has expanded from the four walls of his smithy to include all the activities of mankind.

Today chemistry reaches out beyond the laboratory of how-to-do to the dynamic world of how-to-use. We have in past years entered the sanctuaries of the great trade masters and improved on their secrets —and in so doing have conquered most where we have given most. We have transformed the baiting pit of the tanner from a filthy stench hole to a clean, wholesome tank containing water-clear bait liquor. The haphazard winning of dyes from berries, and Mediterranean mollusks has been replaced by the efficient processes of our modern dye plants—and so on through the list.

New Fields of Endeavor

Turning from these early beginnings among the primitive and medieval arts, we find chemistry looking to new fields of usefulness, such as running laundries, establishing itself in a great metropolitan

newspaper, and guiding the buying policies of a modern department store. There is little need to extend our field of examples. Undoubtedly similar recent extensions of the usefulness of chemistry will occur to the reader. Of particular interest, however, is the fact that chemistry has become more than a closely defined profession—it has emerged from its earlier confinements to become a point of view.

This rather natural metamorphosis is perhaps one of the most upsetting and at the same time most significant factors with which we are confronted today. On our ability to carry ourselves through the transition successfully will largely depend whether we are to return to the laboratory or consolidate our position in the field of executive responsibility.

Upsetting indeed is this change to those conservative die-hards who have taken the past twenty years to understand that the chemist is a dominant factor in industry. Upsetting indeed to the gentleman who will tell you he is the third generation in his business, that experience is the only thing that counts, and that "these here scientific fellows don't know anything anyway." Upsetting also to those who have used executive prerogatives and petty chicanery to masque and sidetrack the efforts of the earnest chemist. We all know the type—he has been in the business thirty years and perhaps his father before him. He will disparage constructive coördination between experience and technical development, fearing possible encroachment on his individual prestige.

Broadening of the Profession

Of more consequence to the chemist, however, is the fact that his profession has broadened from its strictly laboratory limits and now is influencing executive control and guidance of industry in general. Where once chemistry was asked "How can I make?" it is now being asked "How can I use?" Whether or not the twisting of this question was brought about by a chemist is of negligible importance. The fact is that it has faced the chemist about. He now wants to know where his product is going as well as where it comes from. He has come from strictly production and factory control problems to both production and selling problems. Today he must keep a perspective on his product from the raw materials and first steps in production right through the gamut of commercial channels to the user. In simple, the chemist has risen from a role of routine duties in the plant into a field of vision where he is compelled to see the industrial problem as a whole.

Our profession, then, is at a new milestone in its career. What will it do? How will it travel the path before it?

First let us see where chemistry stands today. We find the chemist established in scattering places as economist, banking adviser, lawyer, salesman, advertiser, and as a combination technical expert and publicity agent. Hardy pioneers, these, who have fought through many of the fundamental problems facing a chemist entering these fields and have made the path smoother for those to follow. No one will deny the touches of charlatanism here and there. If not in excess they add color, although at times they work some hardship on the earnest chemist who knows his product, its applications, and his own particular field of usefulness. On the other hand, we see the chemically trained man sitting in councils that a few years ago would have been considered furthest removed from his domain. There arises the question, "What is a chemist?" I would define a chemist as a man equipped with a chemical point of view, no matter what the channels through which he exercises his profession.

An Economic Factor

With this brief panorama of the chemist's widening horizons, it would not be amiss to look at industry's greatest present-day problem—overproduction. In times past the underlying position of American industry has been one of shortage of development facilities, shortage of capital, and shortage of production. From the days of our Puritan Fathers, when a family's food and clothing depended largely on the capacity to produce them at home, the fear of shortage has stalked through the land, first as the guiding influence to produce, and later as the leading incentive to buy. It is within the recollection of most men that the winter housekeeping season used to start off with a barrel of flour and another of sugar, the winter's coal laid in the previous spring, and so on. It took a depression of previously unparalleled proportions, brought on by a surfeit of every known commodity, to teach the mass of people that fear of food or other shortage is one of of the last things they need worry about, and that this specter can be safely relegated to the scrap-heap of history.

The present depression reminds us, however, that the chemist must consider economic conditions, whether he wants to or not.

Bringing all these factors together, we find that the chemist, aided by the trend of affairs, has made his niche in the world. He is now being definitely projected out into the give-and-take of trade relations.

His inquiries have leaped beyond the limits of discovering the secrets of nature as embodied in the interplay between chemical structure and physical properties. Now he seeks methods of using the secrets we already know. The chemist thus finds himself confronted with a field of mechanics that is new to him.

For want of a better term I will call them trade mechanics and will define them as comprising those habits, customs, and traditions that time and experience have molded into a sort of common law governing trade. In effect these traditions and usages are tools by which such imponderables as reputation, guarantees, credits, publicity, etc., are handled. In mastering this new field of trade mechanics the chemist must learn how to use his tools to attain ends that are largely composed of psychological elements.

But this is only his starting point—his scratch mark. If he is to step into this new field that has been opened to him and accept its usages as final, then it would be as well for the world if he stuck to his laboratory. He would merely be changing his vocation from chemistry to another field where the grass is no greener nor the fruit any riper. Rather he should step into this new land carrying with him the beneficial experiences gained from an earlier day when he entered the secret precincts of manufacturing secrets, overcame prejudice by mastering the material secrets and practices as they then existed, and gradually built up the structure of technical accomplishment that we know today. In a word he should master this common law of trade practices with a belief that, once mastered, he will be able to build thereon and guide its development to a more useful purpose.

A Particular Field

Perhaps no better focus for our attention can be found than the field of advertising, and, more particularly, industrial advertising. It is a field into which chemistry has entered with quiet success, it employs the full kit-bag of the tools of trade mechanics, and its goal is more often than not quite imponderable. For the same reason that chemistry books go but little into the whys and wherefores of test tubes, ring-stands, and the other tools of the laboratory, we will not discuss here the various tools of advertising. They can best be learned by experience and they will be of little use to a man unless he does exert his efforts in this field.

It will be more profitable to sketch briefly the goals of industrial advertising and the basis upon which advertising structures are built to attain these ends.

Since some goatherd first drove his flocks through the tortuous streets of one of the buried Babylons, we have had advertising—to wit, public notice of someone's desire to exchange one commodity for another. Through the centuries advertising has come down to us, gathering in its passage crimps and customs, twists, idiosyncracies, and practices that time has shaped, sluffed off, or molded into tradition, until today the raucous cry of our goatherd has grown into an infinite intricacy of detail and means of expression, mysteriously guided from the labyrinthal sanctuaries of our great advertising agencies.

It is this maze of intricacy in modern advertising that we wish to untangle, so that it may stand out in clearer relief for one unacquainted with the field. It is perhaps hardly necessary to note that the following discussion must be considered merely the writer's individual untanglement.

Technical advertising tries to give such publicity to any article or material that prospective buyers will know its name and usefulness, and be ready to act on suggestions that they buy it. But it differs materially from general advertising—so much so that technical advertising, except for the general idea of publicity, might well be considered a field apart.

It would perhaps not be amiss to point out briefly some of these differences. General advertising concerns itself with articles of a broad public usefulness like food, clothing, furniture, etc. It directs its appeal to the ultimate consumer of these articles—the householder. Industrial advertising focuses its attention on articles of more specialized use, such as special machinery for use in a particular manufacturing field, chemicals for use by compounders or manufacturing chemists, ink for newspapers, sugar for the candy manufacturer. It directs its appeal to a more limited group of individuals than is the case with general advertising.

Differences in Public

It is a tenet that general advertising usually directs its appeal to the desires or fancies of a relatively uncritical buyer, whereas industrial advertising appeals to a buyer who is organized to judge, with laboratory tests and on the basis of considerable experience, the real value of the item offered to him and the economic need of his company for that item. In general one class buys from desire, the other from competitive necessity. To one the advertisers say, "You ought to try this new health candy," to the other "This machine will save you two men's wages every month."

There is also another general difference worthy of note. General advertising appeals to buyers who make relatively small unit purchases, while the industrial advertiser wants the attention of a man who will be a quantity buyer.

As may be expected, there are many borderline cases that do not fit snugly into the above broad classifications, but that is a difficulty always encountered when attempting to sort and classify in a new field.

Industrial and technical advertising is merely a specialized branch of advertising where the product is sold to another manufacturing or commercial house for use in carrying on its business. The aim is to make known to possible purchasers the type and kind of article or material being offered for sale, the particular qualities that merit serious consideration by the buyer, the qualifications of the producing company, etc. In other words it is the aim of this type of advertising to bring the article to the prospective buyer's notice and to interest him in the article from an economic point of view. It is not necessarily the purpose of advertising to consummate a sale of the article.

Usual Procedure

The general method of technical advertising is to buy space in selected trade journals, and to send leaflets of an instructive and stimulating nature to a selected list of prospects. In recent years we have also seen a growing number of advertisements featuring technical articles in such general magazines as the *Saturday Evening Post.*

But I doubt seriously if the average reader would take particular note of an advertisement setting forth an article in this manner. The name and virtues of our product must be dressed up to catch the reader's eye. It must hold his attention for a minute, and register some name or slogan on his mind—such as "Canfield—the Oil that Makes Piston Rings Smile"—so that he will unconsciously think of Canfield oil the next time he is in the market. That is the job of advertising and that is what it must do. It is up to the salesman to transform this interest into an actual sale of merchandise.

On the rough outline of the product's name, use, and merits we build a story—a story of short, terse statements, similes, metaphors, and illustrations—all of which aim at creating interest, desire, confidence, and inquiry in the prospective buyer's mind.

We now come logically to a final question—how do we measure the value of our efforts? We have gone through great toil and trouble, to get the advertiser's account. Now we turn for a yardstick to measure our results. It will no doubt strike some as bizarre when they learn

there is no yardstick by which to give any approximate numerical expression to the results. If times are good and the sales record of the company is high, the advertising agency feels it had a real share in the matter. If times are bad and sales are off, the agency may look for complaints as to its copy.

In an effort to know something of advertising results the "coupon ad" is often employed, wherein the reader is urged to send for something free. In direct mail selling we have a specialized field wherein the number of inquiries and the resulting sales can be used as a yardstick. But in general our technical friend will search in vain for an instrument to measure his results. And this point in the advertising field will perhaps strike him as most unreasonable, particularly when he thinks of the measuring devices of his chemical laboratory.

The Chemist in This New Field

Lastly we come to the point of interest in our whole story—the place of our technical man in this field seemingly so far removed from his laboratory. On electing to enter it, he must realize he is taking a step of some magnitude. He will have many handicaps—in particular the necessity for learning the customs and traditions of the field we have called Trade Mechanics. Next he will have to bring up his reserve of technical foundation and learn how to adapt that to the new forces with which he has to deal. And lastly, his job will only be started when he has gone far enough to build on these two foundations of trade mechanics and technical perspective a new rationalization of technical publicity and a method of measuring its accomplishment.

Research and the Organic Chemical Industry

By J. N. Taylor

A chemist who keeps a finger on the pulse of American industry discusses research in the synthetics field.

"TAKE interest, I implore you, in those sacred dwellings . . . laboratories. Demand that they be multiplied, that they be adorned; these are the temples of the future—temples of well-being and of happiness. There it is that humanity grows greater, stronger, better."

Pasteur's injunction has been immortalized in America's institutions. The magnificent researches conducted in our colleges and universities and by our many private associations, institutes, and foundations testify to America's practical efforts to make the world a better place to live in. Intensive studies carried on by Federal public health agencies such as the National Institute of Health, the Food and Drug Administration, the Bureau of Animal Industry, the School Hygiene Division, and other smaller units, augmented by the work of state and municipal health departments are contributing to the amelioration of social conditions with a consequent improvement in the well-being and happiness of our people.

Industry itself, through greater attention to its workers' health and working conditions and by its interest in the latest developments in chemistry and medicine, recognizes the importance of physical and mental health as factors in the efficient operation of its plants.

Not the least contribution to this development has been the research work of commercial firms. A signal achievement of the American syn-

thetic organic chemical industry has been in the field of synthetic organic medicinal products. A large and growing domestic industry has been established during the past 15 years. Many drugs evolved in the chemist's laboratory have become valuable implements in the hands of the physician and have taken their places as useful adjuncts in the treatment of disease and in the alleviation of suffering. Even during the present depression this research program has been maintained in all divisions of this branch of chemical industry. Surely, an industry that can continue and even increase its research activities in a period of world-wide depression must possess remarkable vitality.

Chemical Research Increases

It is refreshing and very encouraging to note in the joint report[1] by Dr. West and Miss Hull an increase in the number of doctorates conferred last year in American universities and that over a third of them were in chemistry. In the "poor year" of 1931 there were 392 (317 in 1930) compared with the "richer" years of 1929 (312) and 1928 (278). Research work by the synthetic organic chemical industry has continued as in previous years. In the case of the coal-tar branch it has expanded. "It is highly significant," states a report[2] of the United States Tariff Commission, "that in a year of acute business depression manufacturers of coal-tar chemicals increased the relative number of research organizations and spent more in experimental activities, despite decreased sales. Those in control apparently realize the vital necessity of research in the continued development and expansion of the American coal-tar chemical industry." Since 1917, the coal-tar chemical industry in the United States has expanded over $38,000,000 in research work alone.

Although it is now nearly three-quarters of a century since Perkin's discovery of mauve, the first aniline dye, the commercial applications of his researches and those of Kekulé, Hoffman, Bayer, Graebe, and many others, were confined for over half a century to Europe. It was not until after the World War that the synthetic organic chemical industry can be said to have really existed in this country.

Prior to the World War this branch of chemical industry in the United States was practically non-existent, only 13 per cent of the dyes consumed domestically being produced here—and those were chiefly from imported intermediates. We were also dependent upon foreign sources

[1] West, Clarence J., and Hull, Callie, "Doctorates Conferred in the Sciences by American Universities, 1930–31," *Science*, **74**, 659, December 25, 1931.

[2] "Census of Dyes and of Other Synthetic Organic Chemicals," 1930. Report No. 19, Second Series, U. S. Tariff Commission, Washington.

of supply for important synthetic medicinals, flavor and perfume materials, photographic and other fine chemicals.

In common with other industrial nations, the United States now maintains an industry, established as a result of research, essential to the comfort of its inhabitants and necessary for the security of its citizens. Conceived in the minds of a few forward-looking industrialists in the dark days of 1914 and born of necessity, the story of its development reads like a romance. Although not yet come of age—lacking several years of attaining its majority—the synthetic coal-tar industry in the United States gives youthful promise of ultimate development into a commanding branch of American industry.

Primarily a development industry, the synthetic coal-tar chemical industry is a great consumer of raw materials from all sources and a large contributor to many other industries. This small, vital industry with a finished products output of only about $65,000,000 furnishes materials for the manufacture of several billions of dollars worth of textiles, paper, leather, paints, lacquers, rubber goods, printing inks, foods, medicinals, perfumes, and flavorings.

The processes used in the synthetic coal-tar chemical industry are closely related to those employed in the manufacture of munitions. Consequently a well-established synthetic organic chemical industry is considered an essential factor in national preparedness.

Research the Key to the Future

The establishment of the synthetic organic chemical industry in the United States has created careers for trained workers and has encouraged the profession of chemist. It is the great training ground for future progress.

To develop and maintain an industry of such a highly specialized character calls for large expenditures in investigational studies. The appearance of what has been termed "economic nationalism" bringing about strenuous world competition and the necessity for unceasing effort to improve quality of process and product intended for consumption both at home and abroad emphasizes the need for constant research. "Today," said Dr. Hale[1] in an address before the Manufacturing Chemists' Association, "we are experiencing a readjustment of our activities to a sane and scientific basis. We must make ready with new projects and new articles of commerce. Every industry should become lavish with money for research; upon this more than all else rests our security

[1] Hale, William J., "This Chemical Revolution," *Chemical and Metallurgical Engineering*, **38**, 349, June, 1931.

Courtesy E. I. du Pont de Nemours & Company
SYNTHETIC AMMONIA AND METHANOL PLANT

for the future." And, as recently pointed out by Dr. Redman,[1] in speaking of certain "unescapable" charges, "It is time that there be added to these a charge for adequate and sustained research, without which no industry can progress, if indeed it can long survive."

Continued progress and forward development will be assured America's key industry by fostering and exercising the spirit of research in well-equipped and well-organized laboratories.

[1] Redman, L. V., "Research as a Fixed Charge," *Canadian Chemistry and Metallurgy*, **XV**, 318, December, 1931; *Industrial and Engineering Chemistry*, **24**, 112, January, 1932.

Occam and Atoms

By K. P. McElroy

A chemical philosopher discusses the present trend of atomic theory. Are present-day hypotheses sufficiently backed up by fact?

I HAVE a penknife which, so far as I can see, fills sedately and respectably the place in the scheme of things intended by its maker. It is none of your vagrom, irresponsible, feckless pocket pieces, perennially lost or mislaid; it is always available when it is wanted. It goes where I go, and a hand in my pocket will locate it.

Nevertheless and notwithstanding, I am told by a star-gazing friend with a relativity yen, that I do not see far enough; that the quiescence of my knife is an illusion and that it is actually in swift gyration in the interstellar void, following a path curvilinear in three dimensions, or maybe four, and never in the same spot twice; moving in a path and at a speed the resultant of 10 miles a minute around the earth, 18 miles a second around the sun, an unknown forward velocity in the line of flight of the solar system, and a swirl of the Galaxy. Presumably he is right; I cannot argue with an astronomer as to what happens in the great open spaces, even if inter-professional courtesy permitted. So, I accept his conclusions as to the peripatetic potentialities of my pocket knife. I have an unusually easy-working believery.

But the case is different when an astronomer comes down to earth and, so to speak, sinks the macrocosm in the microcosm by alleging a stellar structure of matter, including my knife blade. Inter-professional courtesy reverses and I refuse to believe any theory inconsistent with the blade keeping an edge. There is an edge; in fact, I have been cherishing it for some time now with the aid of a carborundum hone, the only thing I can find with authority enough to prevail over the stiffness and strength wrought into the steel when it was worked and tempered. The maker gave the metal fixedness and hardness by strains and tensions produced between adjacent particles; strains that involve a locking engagement of some kind and that persist today; that will persist indefinitely, since the knife is a good knife.

Sir Arthur Eddington is an astronomer voicing an up-to-date mathe-

matical view of the nature of things when he describes his writing table as "mostly emptiness. Sparsely scattered in this emptiness are numerous electric charges rushing about with great speed; but their combined bulk amounts to less than a billionth of the bulk of the table itself." This is more a description of a solar system afflicted with comets than of his table or of my knife.

That my knife edge consists of spaced and isolated particles rushing about, attracting each other but kept apart by a system of checks and balances between unknown forces, lacks quite a little of being plausible to me. One difficulty is that a floating equilibrium of any kind would have relieved those strains long ago; if indeed they ever could have existed. So I doubt Eddington's view, which, however, is that of many physicists. The suspicion is partly based on my knife edge and partly on "Occam's razor." William of Occam was a medieval logician who made himself desperately unpopular with his contemporaries by criticising their reasoning when it did not agree with a dictum (called his "razor" because of its cutting quality) that, "Neither more nor more onerous causes are to be assumed than are necessary to account for the phenomenon." In other words, Occam objected to theories based on multiple assumptions.

CHEMISTS gave the astronomers spectrum analysis to demonstrate the constitution of the stars. It turned out to be a sort of Pandora's box; spectra have come back to plague us in explaining matter. Spectra are not the only properties of matter. As a tribe, chemists live up to the Gilbertian line; their "taste exact for faultless fact amounts to a disease." Astronomers are large-minded gentry inclined to much deduction with minimal observation; something like Sherlock Holmes, who could deduce a murderer from a cigar ash. So are their near kin, the mathematicians, some of whom would be poets but for an incident of education.

The astronomical first impression was that matter is a sub-microscopic replica of the solar system; a collection of orbs and satellites obeying celestial mechanics. The mechanics were soon out of order; but the orbs remained and the mathematicians have been playing ball, calculating orbits to agree with spectra and spectra to harmonize with orbits. Matter is an open textured universe to give room for orbits which are not good neighbors. Disparities between fallible Nature and infallible theory are patronizingly dismissed by somebody since "at atomic distances the concepts of time and space must be revamped" and "within the atom there may be no geometry in the ordinary sense."

It is unfortunate that the atom, invented to explain matter, should not have the properties of matter; unfortunate for the explanation, that is.

TO THE chemist the concept of an atom is not an actual necessity. The phase rule dispenses with any grained structure of matter and is able to do a fair day's work explaining; in fact, phase rule principles, mathematically developed, lie at the basis of most things.

But atoms there are; and the relativitist admits their absolute character as units of Nature; which is a singular, unshared distinction. Most atoms are imperishable, indestructible, unchanging and unchangeable entities of fixed weight, shape, and size. It is a conclusion that they are hard and rigid; but not far-fetched. Possibly, our ideas are colored somewhat by the inability of the human mind to realize anything but a solid and a hole between solids. Chemists are human; most of them, anyway. An atom may be hollow, as Rutherford thinks; it may have as many parts as Moseley counted; it may be packed with titanic and tetanic forces in lockjaw engagement, and so on; but its internal affairs in no way affect its behavior. When an atom hooks up with another to form a molecule, it stays hooked. And in particular, it does no rushing around.

If there is not a locking engagement there is the equivalent; and the equivalent would be the same thing. Without it, our chemical compounds (and my knife blade) could not exist. An organic chemist puts together atoms in tens, in hundreds, or in thousands to form molecules of intricate patterns; and he expects the molecule and the pattern to persist. They do. Mobility is ruled out. A tetrahedral carbon atom, with atoms or groups attached to the corners, forms a stable system and what may, can, or does occur inside the tetrahedron has no effect outside. Langmuir's octets and cubes and shells, with electrons and protons staying in their appointed places, may not express a real shape or form; but they do express relations which are leading to clearer thinking in inorganic chemistry. I can even stand for octets in my knife blade; Langmuir is not using electrons as ball bearings.

IMPRESSIONISTIC screen views given by X-ray diffraction are doing more to advance our knowledge of solids, including my knife, than all the mathematical disquisitions on atoms that ever came out of college. All we see is a lot of spots; but the spots are in orderly arrangement, and that means structure. By some really brilliant work and geometrical reasoning, structural units have been deduced which

have the great advantage of seeming to exist. These "space lattices" (which does not imply either that they contain any empty space or are lattices) fit in with the great body of our other knowledge. Also the lattices fit together; and it is comforting to find something solid in solids to give solidity.

The chemist wants and uses a static atom because he must account for a lot of chemical facts; hard facts like my knife. A physicist likes a dynamic atom as lending itself to mathematical analysis—provided it is an H-atom with a single electron. Calculating the relativity of more than two moving bodies is the old "three-body problem" unloved in mathematics. Even helium and molecular hydrogen are too complicated to be popular in orbit-figuring circles.

There are some half dozen physicists' atoms current; all mathematical studies of a single phenomenon, the spectral lines emitted by hot luminous matter—and all relating primarily to a single thing, a cold isolated H-atom. Eddington is extrapolating from this H-atom in figuring out his table.

The best known mathematical atom is Bohr's; which is Rutherford's recalculated. Schroedinger's atom and Heisenberg's atom are improvements. Planck and Einstein threw our old ether out of the window when they introduced us to quanta; but Schroedinger reinstates it, together with a sub-ether having ripples which heterodyne to waves doing duty for structural purposes.

Bohr's H-atom is the sun and planet idea; a stable, self-contained system of an electron satellite circulating in an orbit around a proton nucleus. Electron and proton attract each other to establish the orbit; but they never come together; there is never a crash, although the orbit often shifts and the satellite speed varies. It is in these shifts that light is emitted. All this is picturesque and likely good arithmetic, assuming the data; but as a matter of detail, atomic hydrogen strongly objects to existing at ordinary temperatures; probably never does exist except in a state of nascency or in one of Langmuir's trick tubes. A real hydrogen atom has a clinging disposition quite unlike that of molecular hydrogen; and when it ought to be isolated it is not; it combines with anything else handy; usually with another hydrogen atom.

On the other hand, there is no electrical or architectural reason why one mathematical hydrogen atom should combine with another; there is no occasion for two positively charged protons and two negatively charged electrons to come together as a double star. As an artifice, if there be two protons spinning in opposite directions, and if these spins create magnetic fields and if these fields be strong enough, there

might be a magnetic coupling. Which must make the shade of Occam shiver.

The Bohr atom is better adapted to celibacy than to molecularity; being a creature of pure mathematics it is not suited for a social life. The rude hurly-burly of a hydrogen atmosphere, with bouncing molecules pounding each other to keep up pressure, is no place for outstanding electrons or for magnetically coupled atoms depending on a fortuitous concurrence of opposite nuclear spins. Of course it is quite possible to imagine fourth or fifth power repulsive forces cushioning collisions and preventing electrons wasting their substance emitting light in compulsory orbit hops; but Occam might dissent.

IN ANY event, chemistry is based on the fact that different substances behave differently; have to, to keep from being identical. Analogy proves nothing and itself must generally be proved in the laboratory. Hydrogen is not like anything else in any particular; it has no analogues. If it had, its properties would prove nothing as to theirs. As a gas, it is not like any solid. It is the apotheosis of paper and pencil work to create an imaginary hydrogen atom of imaginary properties and to reason by analogy until Eddington is convinced his table is just gas.

In chemistry there is little profit in grasshoppering around through the unknown, with or without mathematics, hunting the non-obvious. Our progress has been step-by-step plodding and it is apt to continue that way. Nice new theories based on deductions from other theories usually peter out after a time, like the "new economics" of 1929. And a gaseous or stellar structure of my knife blade emphatically is theory sur theory.

Nevertheless, there is probably something in each and every one of these modern mathematical speculations, including Dirac's equational proof that integers exist, so that it is all right to count in units, 1, 2, 3, 4, 5, and so on, in lieu of using surd figures. After the smoke of battle, which is to say the cloud of flying symbols, clears away and the mystic symbols "qp" and "pq" (which do not equal each other) come into their own, there will quite certainly be something of value left. It is likely to come sooner via X-ray than via spectra, which leaves too much to the imagination.

But as the old saying is, what comes out of the mathematical mill is what is put into it; and supplying as input a non-existent hydrogen atom of impossible properties does not contribute to the respectability of the output. Hydrogen atoms hot enough to emit light are not ordinary matter and their testimony contributes nothing to the under-

standing of my knife blade. For that I require the three-dimensional space lattices of the X-ray pictures, and atoms and molecules that lock together to render them possible.

Still, these mathematical atomic melodramas make interesting reading and they are certainly good for insomnia. To me, they have all the charm of a detective story with plenty of logic and deduction, even if the evidence be a bit weak and the people not acting like folks I know. The plot's the thing.

Chemical Queries

Fire Extinguisher

A company is desirous of obtaining a powder which will act as an efficient fire extinguisher.

Will chemists who can produce such a powder please communicate with this office, attention "F. E.?"

Water Repellent

A company is looking for a product which is either water-soluble or can be emulsified, and which will render fabrics water repellent.

Please communicate with this office, attention "W. R."

Chemist Wanted

A Southern company is looking for a chemist experienced in dyeing, particularly in the coloring of pyroxylin and other plastics. He must be a man of experience who is willing to make his permanent home in the South.

Please communicate with this office, attention "T. C."

Shall Reports Be Used in Advertising?

By E. F. Cayo

A consulting chemist discusses professional ethics as regards advertising. A suggested solution of the problem.

DURING this past year there has been some discussion of the ethics of a chemist in making a report to be used for advertising purposes. This subject should be given careful thought by all qualified chemists. In the use of a chemist's report for advertising there are dangerous pitfalls, not only for the chemist making the report but for the chemists in general. Any code of ethics for professional behavior requires policing. It is in this sphere that the A. I. C. can make itself felt as a force for high professional standing of the chemist.

It would be well at the start to quote from the code of the A. I. C. some sections relative to this matter:

Section 5. "He shall refrain from associating with or allowing the use of his name by any enterprise of questionable character."

Section 6. "He shall advertise only in a dignified manner, being careful to avoid misleading statements."

Sub-Section *e* of Section 18. "He shall not suppress information nor accentuate statements in reports for the purpose of making gain or profit for himself or others."

Two views of the question of using chemists' reports for advertising have been given:

1st—Yes. It is ethical when authorized.

2nd—No. It is not ethical and should not be authorized.

I wish to make clear at the start that I am not stressing this subject as more important than others in the code of ethics of the American Institute of Chemists. It is worthy of consideration only in proportion

to the frequency with which reports for advertising are shown to deviate from truthful statements and findings. That some reports so used are distorted statements cannot be ignored. Sometimes this is done by advertising people without authorization. So far as my experience for ten years with a consulting group is concerned, this type of report has played a very insignificant part in its net income. I do feel, however, that the subject should be given a clear statement in the code of ethics of the A. I. C.

It is apparent to anyone that some reports do not contain sufficient data to be authorized for use in advertising or for any other purpose. Likewise, some commercial products, such as quack medicines, are outside the scientific field, no matter how much data may be obtained. However, let us confine ourselves to materials about which very definite and correct data can be obtained.

The codes of ethics of various consulting groups authorize the use of such data for advertising. In reports of this kind the truth is sought; the facts substantiating it in the light of accepted scientific knowledge are reported, and an honest opinion is derived.

Does a Chemist Sell His Reputation?

I do not think a chemist sells his reputation in doing this. He should receive adequate remuneration for this service, compensation for the training and experience that have made him capable of rendering a trustworthy report. He should get considerable satisfaction outside of the fee for a piece of work well done, which should enhance his reputation rather than detract from it. Naturally, for his own welfare, he must be highly concerned as to what subject matter and what client are involved in a report to be used for advertising. It behooves the chemist to follow up closely any authorized statement, to see that there is no distortion in its use.

I feel that the client should receive what value he can obtain in advertising if authorized by the chemist to use such a report.

Outside of teaching, a chemist, whether employed in industry or in the consulting field, is very definitely in business. For his welfare economically and professionally he had better learn as fast as he can the business point of view. I have even heard good teachers call their teaching their business. The point made by the objector to the use of chemists' reports for advertising is that the chemist steps out of professional standing into business and thus removes himself from the classification of strictly professional people.

Is this true today? Can we maintain a position for chemists akin to the ideas held for the older professions of law, medicine, and the ministry?

To me the development of the chemist to professional standing is a new development, and a new profession cannot be exactly compared to these old professions.

I would class the chemist of *recognized training and experience* in teaching, pure science, and the industries, as a professional man or woman.

Or am I wrong? Should only the chemist who is in the teaching field or in pure science (with no consulting on the side) be the professional chemist?

A Possible Solution

I have a few suggestions to make, hoping only to assist in this discussion and to aid the committee. Would it not be well to look at the ethics of consulting groups as regards advertising? What do the British Institute and Canadian Institute say about it? Would it not be advisable for the American Institute of Chemists to set up a jury to pass on the ethics of such reports as any chemist may submit?

Such a jury would add to the value of the Institute and be an added reason for its existence. It would enhance its prestige. The Medical Society has such a committee, the Committee on Foods.

Could not such a committee receive reports for the protection of the chemist so that the American Institute, if it approves the report, stands ready to prosecute any unethical distortion? It could call attention in the press to such distortion of facts submitted. No company is anxious to get adverse publicity from a body of scientists.

In any case, reports of chemists should be carefully safeguarded by an accompanying statement—"Not to be used for advertising unless authorized."

Some Reports Actually Used in Advertising

It may be helpful to list a few actual reports that have been used in advertising. The writer is not attempting to endorse any of these types, and he hopes to be more enlightened on the subject.

I.

Actual data type, used in a pamphlet. The company wished to show how a process caused rapid absorption of oil from bath.

REPORT OF ANALYSIS

Soak Bath	*Total Oil*
Original bath at start	2.17 gm. per 100 cc.
At end of 10 minutes	0.41 gm. per 100 cc.
At end of 20 minutes	0.23 gm. per 100 cc.
At end of 30 minutes	0.097 gm. per 100 cc.
At end of 40 minutes	0.074 gm. per 100 cc.
At end of 50 minutes	0.060 gm. per 100 cc.
At end of 60 minutes	0.060 gm. per 100 cc.
At end of 70 minutes	0.054 gm. per 100 cc.
At end of 80 minutes	0.054 gm. per 100 cc.

These tests show we consider that the bath is exhausted for all practical purposes of your process at the end of fifty minutes.

II.

Testimonial type:

CERTIFICATE OF ANALYSIS

THIS IS TO CERTIFY that I have examined a sample of ———— manufactured by ————, and am familiar with its methods of preparation. I find by analysis that its ingredients are PURE and of an EXCELLENT quality, thus proving that it may be used with safety and satisfaction for the purpose of flavoring articles of food or confectionery.

———— ————, Ph.D.

Analytical and Consulting Chemist

III.

Comparison of competing products type, where definite data are obtained under standardized conditions:

"We are reporting herewith on tests we have made on fourteen ———— including your ————. All samples purchased on open market by ourselves.

"All these tests were made in duplicate and under household conditions, in a small room such as would be found in dwellings.

"The details of the tests are given on accompanying pages.

* * * * * * *

"It will be seen from these results that your ———— was distinctly the most effective product."

This report was used by reprint of a photostatic copy, excluding the names of competing products.

The report was signed before a notary public by the chemist and was kept on file for inspection by the company.

IV.

The inadequate and questionable data type is shown in the report of the American Medical Association on "Listerine and Other Mouth Washes," as advertised in the *Lancet*, London, England; see *A. M. A. Jour.*, **96,** pp. 1303–08, 1332, 1909.

In striving for a high standing of professional conduct for the chemist, I am conscious that there is great need for ideals. At the same time, one cannot lose sight of the fact that the lot of a very large number of chemists is very decidedly thrown into the business world where they must use their best judgment in the light of training, experience, and any guiding ethics that may be at hand.

After all, the important thing in this case seems to me to be: Is the report the truth or, to put it in another way, does it give the facts in the light of present scientific knowledge?

WHY I CHOSE CHEMISTRY

Chemistry as a Philosophy of Life

By C. A. Nowak

MATURE thought and a clear understanding of our likes and dislikes are indispensable requirements in the choosing of a line of conduct which is to dominate our life until its termination. It is rarely that a student realizes the full importance of his decision when he selects his studies to fit himself for a particular profession.

A request from the editor of *The* CHEMIST to write for publication a few lines on "Why I Chose Chemistry as a Profession" prompts me to jot down a bit of my life's history in so far as it has a bearing on this subject.

As my father and my grandfather were chemists before me, it seems natural that I should follow in their footsteps. What actually happened, however, was not quite so simple.

My father had chosen his first born to continue his work; but my brother showed little interest in the sciences and espoused the arts instead. I was launched on a business career; but I soon realized that commercial occupations were most repugnant to me. I disliked routine.

An interest in the unknown, in whatever shape or form, dominated me. Experiments fascinated me. As a boy, I was always anxious to know what was around the corner or what was just on the other side of the hill.

This possibly accounts for my craving to this day for exploring unknown roads and unpaved ones, an obsession which my wife claims will at some time lead me into dire straits and has already led to many family arguments. My wife likes the highways and I the byways of travel—they are more interesting. To follow them may be both disappointing and time-consuming; they may lead nowhere, but just the same they are interesting; they offer a splendid opportunity to obtain first-hand information.

PERHAPS my interest in chemistry was originally aroused when, as a boy, during vacation time, I assisted my father around the laboratory, doing such work as is usually assigned to a laboratory boy. When the cat is away, the mice will play, says an old proverb. Left alone I sometimes tried experiments not found in chemistry texts (and I soon learned why). Through darkroom work in photography, I became acquainted in a practical way with the interesting action of sunlight on different chemical compounds. I made my own solutions and sensitized my own papers. The study was interesting, even absorbing.

When I discovered that I was not cut out for a business career, I went back to college with my heart and soul set on the study and teaching of chemistry. My university years were split about evenly, being devoted to the study of chemistry on one hand, and to the study of psychology, sociology, and philosophy on the other. I owe a great deal to my teachers, who made my student years the most interesting of my life. I feel especially indebted to my Dean, Professor James Rowland Angell, now President of Yale, under whom I studied psychology and who permitted the planning of the unusual curriculum I had decided I wanted.

Immediately upon graduation, as a result of an advertisement in the "Help Wanted" column of the Chicago *Tribune*, my future career was determined. The laboratory I entered was one of the largest serving the fermentation industries. A technical college was operated in connection with it. It was here that I was given an opportunity to teach and make friends with men in the industry who are now my clients. I had time for research work and literary work—work of such varied character that, no matter how long the hours, it could never get tiresome.

SINCE that time many changes have taken place. Over twenty years have elapsed and throughout those years it has been my interest in, and knowledge of, chemistry which has enabled me to acquire a better understanding of the world we live in—and of life itself. In an entirely new light I saw life as it envelops us and as it is manifest in the growth and development of the organic and inorganic and continues beyond death into infinity. Indeed, life on this planet and in the universe can be better understood through a knowledge of chemistry, biology, and physics. The greater vision obtainable through a better understanding of these sciences enables us to harmonize philosophy, religion, and science and contributes to a greater appreciation and enjoyment, by us, of our being.

Chemistry, with some, is a profession which they serve faithfully. Some regard it merely as a fairly easy way to earn a livelihood; others look forward to the possibility of its leading to developments of great commercial value.

To me, my knowledge of chemistry is serving as an introduction to a better understanding of psychology, philosophy, and religion. It is also my daily occupation, furnishing the necessities of life for the comfort of my family. It is my way of earning my daily bread and, I must say, a very interesting one. Every day brings new problems; every day offers opportunities of helping others. When the evening comes and the day's work is done, even then the study of chemistry and the allied sciences serve me as a hobby, more interesting and more absorbing than any other I have known.

The Berezniky Chemical Combine

By L. G. Khvostovsky

One of the important chemical projects of the U. S. S. R. How chemistry is contributing to Russian development.

BOTH as regards the scale of construction work and its economic significance, the Berezniky chemical combine occupies a position worthy of comparison with that of the Magnitogorsk steel mill, the Stalingrad tractor plant, or the Dnieper industrial combine. The combine, situated in the Ural Region on the Kama River, 30 kilometers south of Solikamsk, is being constructed in two sections, the first of which is now nearing completion. The cost of the first section alone will be over 100 million rubles ($50 million), of which about 60 per cent will be expended for equipment and its installation. The value of the annual marketable output of the entire combine is set at 100 million rubles (in 1926–27 prices), and of the first section at 45 million. Of the total annual output of the first section, amounting to approximately 300,000 metric tons, the greatest part will consist of chemical fertilizers.

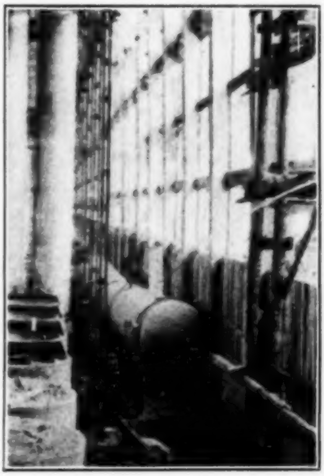
Production of Fertilizers

An increase in the supply of chemical fertilizers is of utmost importance for the further development of Soviet agriculture. In pre-war Russia the manufacture of chemical fertilizers was practically unknown. Although a number of new fertilizer plants have been opened in recent years, such as the Konstantinovka plant in the Ukraine, the output is still far below the needs of the country. The Berezniky combine will provide sufficient nitrogenous fertilizers for 300,000 hectares (741,000 acres) of cotton land. Its economic significance is clear when it is

realized that the higher cotton yield resulting from the fertilizer to be produced by the first section of the combine will result in an increase in the annual output of cotton fiber estimated at over 36,000 tons.

Capacity of Combine

The Berezniky combine is expected to provide Soviet agriculture with 80,000 tons of concentrated fertilizers in 1932. In addition, it will manufacture potassium salt, important as an aid in raising the yield of flax and potatoes, and soda, of which the soap and glass industries have suffered a shortage.



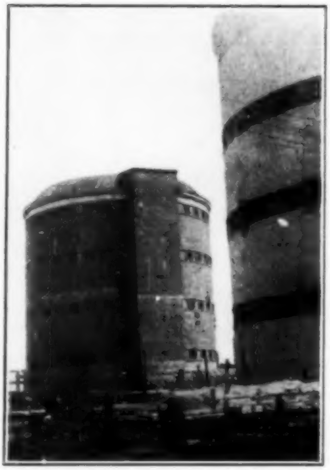
CONSTRUCTION INTERIOR

The first section of the combine consists of ten chemical plants, each comprising a number of departments. In addition there are several large auxiliary structures: a steam and electric power plant, a water pumping station, seven mechanical shops (a boiler shop, foundry, etc.), and others. These auxiliary structures will serve both sections of the combine. An idea of the scale and capacity of the combine may be gleaned from the size of these auxiliary structures. The power plant has a capacity of 80,000 kilowatts (more than the Volkhov power plant near Leningrad) and a steam capacity of 600 tons of steam per hour. The five boilers will provide steam with a pressure of 60 atmospheres, each boiler producing 120 tons per hour. The pumping plant will provide 26,000 cubic meters of water per hour. The cost of these auxiliary structures alone will total about 60 million rubles ($31 million).

Practically all the construction work for the auxiliary plants and the buildings making up the first section of the combine was completed in the fall of 1931. All the equipment is extremely complicated, the greater part of it being of a type never before installed in any plant in the Soviet Union. It has had to be set up with the minutest exactitude and in some departments under conditions of high temperature and considerable pressure. Since the combine is so devised that all the separate departments constitute so many links in a chain of mutually connected

production processes, every item of equipment in each department must be correctly installed before the combine as a whole can commence operations.

The sulphuric acid department, with a capacity of 120 tons per day, started operations in December, 1931. Beginning with the second quarter of 1932, when the plant as a whole is expected to be in operation, the combine itself will use the output of its sulphuric acid department. Until such time it is planned to ship the output in special tank cars to the Perm superphosphate factory.



GAS HOLDERS, BEREZNIKY

Location and Raw Materials

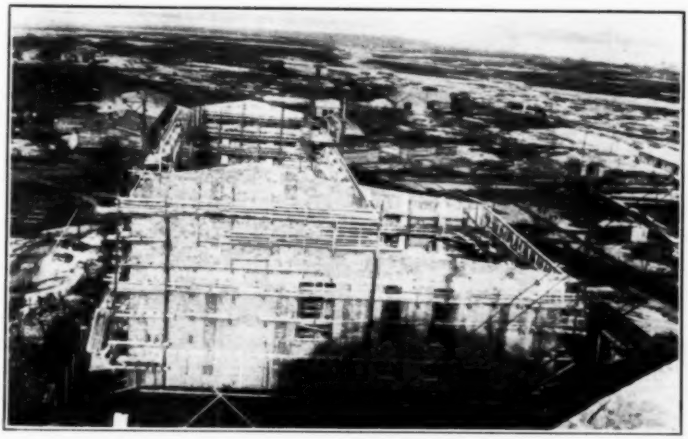
The combine is ideally located as regards raw materials and fuel. In close proximity to the plant are rich deposits of limestone, sodium, and magnesium salts, phosphorite, sulphur pyrites, etc. Thirty kilometers to the north are the famous potassium deposits of Solikamsk, and 90 kilometers to the south lies the Kizel coal basin, which will provide a large amount of waste products for the chemical industry, as well as cheap fuel. Recently new coal deposits were disclosed only 35 kilometers from Berezniky.

Although situated at a considerable distance from the agricultural sections which will constitute the main consumers of its products, this disadvantage is in part obviated by excellent water transportation in the summer on the Kama River. Railway facilities are at present inadequate, but plans are being made to improve this situation.

New Town Being Built

Two kilometers from the combine, in a wooded section, a new town to house 12,000 workers is well under way. Each apartment house will have a community dining room, kitchen, laundry, etc. A hospital was already opened there last fall, and schools, a chemical institute, theaters, etc., are nearing completion.

Foreign technique and machinery have played an important role in the construction of the combine. The designs, especially for the ammonia



BOBRIKOV-DON CHEMICAL MILL, UNDER CONSTRUCTION.
One of 518 new enterprises which will start operating this year.

plant, were drawn up by the Nitrogen Engineering Corporation of New York. Although some of the machinery and equipment was imported, Soviet plants provided a good proportion of even the new, complicated machinery, previously not manufactured in the U. S. S. R. The management is entrusted to prominent Soviet chemists.

Honoring a Chemist

THE late ELWOOD HENDRICK in defining the chemists of the future could have found in the present an excellent precedent in the person and achievement of Dr. CHARLES H. HERTY, who has just been awarded the medal of the American Institute of Chemists for noteworthy and outstanding service to the science and profession of chemistry. The author of the *Percolator Papers* insisting that degrees in science should be awarded only to those familiar with the relations of science to human affairs, would have found him pre-eminently qualified. His life as a chemist has been devoted to relating his every scientific act to the general welfare, whether in his early days when he saved a self-destroying industry, or in his later years when he has been helping his science to do more for human health. He has been, not a colloidal recluse, but a crystalloidal personality, driving and permeating.

He is even better defined in that same delightful work of Dr. Hendrick's in terms of a human catalyst—one who brings insoluble spirits into solubility and yet is himself unchanged—who in the midst of gloom "instigates reactions of joy." He brought as a young man great benefit to his home State of Georgia by researches which revolutionized the turpentine industry. Professor Mims in his "Advancing South" estimated several years ago that Dr. Herty's contribution had already added more than $10,000,000 of annual value to that industry. Recently he has turned his attention again to Southern forests in studying the possibilities of making paper pulp from the slash pine, a new laboratory having been built for that purpose in his native State.

He has shown himself the farmer's friend in demonstrating that the farm is itself to become a laboratory in which the direct products of the soil are converted to uses never dreamed of in the long past of agriculture. When the chemist's work is done there will be no longer question about the utilization of surplus farm products. But the wider public will have chief reason to thank and remember Dr. Herty for his efforts in finding support for chemical research in every field. He has himself had an influential part in securing the establishment of the National Institute of Health. It is particularly pleasing that one who, like Iapis, chose "to ply the silent art of healing unpraised" should have such recognition from his own profession.

—Editorial in the New York *Times*, January 26th.

How Deal with Unemployment?

By Frank G. Breyer

A discussion of the work of the unemployment committee of the chemical societies in New York, as reported at a meeting of the New York Chapter of the Institute.

I THINK everyone who makes a speech should state something about his background, because his background will determine his present point of view. As regards my own viewpoint, I am essentially liberal. I am tremendously interested in science. For over ten years I directed one of the first five research and development companies in the country. I am interested in the application of science to the problems of industry, and in the production of more radios, more bathtubs, more beautiful white paint, more dye castings out of zinc. But I am never so much interested in these things as I am in the people around me.

I admire the great discoveries of scientific laws and the great hypotheses which result in physical accomplishment, but my interest is in individuals rather than in the technical side of their work. It is my observation that just as much is accomplished, and just as much technical improvement is made by placing the individual first and the technical side second, as by placing the technical side first and the individual second. Those who place individuals first are the people with whom you would rather work.

Technical men have occupied various positions in history with respect to other groups of individuals. By and large, however, the preoccupation of a technical man with his work has generally resulted in his failing to obtain a material and social status which his mental capacity warranted. I do not believe that anything we can do is going to change

that situation. I believe we are technical men because we are more interested in technical subjects, and because we are absorbed in making the wheels go around.

Must Change with the Times

There is no use in having technical men decide on one course of behavior for all time. We must change our point of view as the times change. But it is well for us to pay attention to our needs, since we are all reduced to the level of our needs.

I am not here to argue the trend of the next decade; but there is at least a possibility of having to face a situation entirely different from that of the past twenty years. The chemist must give more consideration to himself and less to his work if he wants to maintain himself as an individual, and in a class where he belongs.

Most of us are old enough to know that life has changed essentially in the last fifty years, and especially in the last twenty-five years. Industrial and technical progress is said to be greater in the last twenty-five years than in all the centuries up to that time. As a result of inventions the development of civilization during the last twenty-five years has been greater than that of the combined centuries.

There was a time when our best interests were served by acting as individual units; but apparently the industrial and social changes have made it almost impossible for the individual citizen to accomplish anything. It is only due to association with others of like minds that man is able to get anywhere. For his own good or the good of his class he must cooperate. Almost all of you are familiar with the good that redounded to the medical profession, the lawyers, and others as a result of their associations.

We chemists have put ourselves into a class of disinterestedness. Perhaps we have reached too high a degree of abstractness for us to be socially conscious through organization. That may have been true up to a certain period; but isn't the present a time for the chemist to organize? I am not arguing in favor of a selfish approach; I put it rather on the basis that unless we are represented before society and before government, we are going to lose out.

There is no doubt that the organization of the farmers is responsible for the effectiveness of their lobby in Washington, which resulted in the farm group getting the first dip of the government surplus. Bankers, railroads, insurance companies come along. Highly organized, they will ask for loans.

I am not a pessimist. I am only viewing the results of organization for a few groups. If the rest of us are not organized in the voting of government money, there is very little chance of its finding its way back into the treasury again. The present situation is harmful to the nation; and the quickest way of bringing it to an end is for all groups to organize themselves, so that everyone and not a limited number will be taken care of.

At present some are taken care of and the rest suffer. It is not the general level that is harmful. It is the disproportion that causes the trouble. If organization is to be the way of representing individuals in the future, then I contend that all groups must be organized. All this has become very evident to me, and more particularly in the last week or so. The engineers have accepted that premise; and there is no doubt that they have benefited very considerably from their early organization. The engineers through their four foundation societies have not only canvassed their constituents and established their needs, but have been able to take care of them.

Procedure among the Engineers

The most important thing I have learned is that the group of people corresponding most nearly to ourselves (the engineering societies) gave a considerable proportion of their money in the beginning into the hands of the four founder societies. That money was to be spent on engineers and not given to professional bums, or any other class of society; but the engineering industry was not in any way indebted. That was a wise professional move, and shows the advantage of organization.

The basic principles of the American Institute of Chemists have more immediate application to chemists and chemical engineers than do those of any of our other chemical societies, which consider mainly the technical advancement of the chemical industry.

As an interested observer, and as a chemist acquainted with many of your membership, I say there was never a time when the purposes of the American Institute of Chemists were more important or more appealing than at the present moment. Mr. Kenney's suggestions that the American Institute of Chemists should expand at the present moment is quite apropos. The sole purpose of most of the other chemical organizations seems to be to increase the extent of the technical literature. I think the appeal of the A. I. C. is that you have a rallying cry. You do not realize how potent that is. Mr. Kenney

realizes its worth and its extent. Many members of the other groups do not realize the intensity and breadth of this matter.

For those in trouble and those who are in need, much can be done. Primarily, there will result benefit to chemists as a whole; secondly, benefits to the scientific technology of chemistry.

Seriousness of the Situation

Let me dwell a bit further on how serious things are. I do not think such a serious general situation has occurred before. The idea that chemists and chemical engineers are not going to be affected is ridiculous. Like every one else, chemical companies will have to cut.

The seriousness of the situation manifests itself in various ways. Actually not all of the chemists and engineers are in dire distress. Moreover, the general hesitancy on the part of white collar men to come out and state their difficulties has been a great detriment in determining the degree of their need. The Chemists' Club Employment Bureau gets about one-half of the unemployed chemists in Manhattan.

We of the unemployment committee are in general getting a more distressed group; or else we have a better measure, from being known as the one place where a chemist can actually register his financial status. This is a first picture that everyone would appreciate. In addition there are probably 500 to 1500 other men who are not down to any depression stage but who are down to the stage where their morale is hurt. It may be that they are unjustified in many of their conclusions, but you will find more people worrying about losing their jobs than you will find people out of jobs. For every unemployed man—1500 in this district—there are two or three others who fear to be in that same condition next month.

We should give our first attention to those in difficulty and to making those in positions feel secure. Let them feel secured by the constructive efforts of a body that has power. This is an unfortunate time to ask for acquisitions to any society, but it is not an unfortunate time to plant the seed that will make chemists realize that we are going somewhere. American chemistry has had a wonderful thirty years—and a wonderful ten years. May we have another ten years of wonderful things. But the good of the chemist requires a professional organization. It is quite apparent to me that, in times of stress, the fact that the four engineering societies can act as one is a very important matter. Under the present circumstances, some form of united action can be brought to bear on the situation.

I am not here to plead for a combination of the chemical societies, but if this should be found necessary, the A. I. C. has the banner around which the others should rally. The fact is that for the moment chemistry is less important than the chemist himself, and the Institute is the proper group to take the greatest initiative in this matter. With that background, let me talk to you about the unemployment committee.

The primary purpose is explained in the title—"the unemployment committee." To accomplish our purpose we have felt that two things must be attained. We must get immediate financial support to give jobs to a certain number of chemists in their own profession. Second, we must get jobs for men in industries not now using chemists. These two objects have to be achieved through the following steps:

1. The organization of a committee of the unemployed themselves, so that they may feel that they are doing something for themselves and for others.
2. Contact by this committee with the proper persons to place these men.

It has been impossible to do anything about getting jobs in industries not now employing chemists. The first problem is to get money. We cannot get money until we can present our case; and we cannot present our case until we have a registration. This is a vicious circle. We cannot get a registration until we can get jobs. Men don't want to register just for the sake of registering in one more place. If we can get ten fellows into jobs, then the unemployed will know we are doing something.

Collecting Data

We are going to call a mass meeting of the societies so that we can give out figures. At the present moment we are perfecting our survey so that our statement will be accurate. This plea to our membership will filter automatically back to the group we are registering.

At the time of the mass meeting we shall ask for the individual support of all chemists and engineers in every possible way. We hope to have many chemists helped by their own companies. Many industries don't have to pay the accustomed salary to men who know they may be dropped. Men might go to their employers when let out of more expensive positions and say: "Is there something I can do here at $5.00 a day?" Many would undoubtedly be taken care of in this way. Otherwise, they have to work somewhere else for $5.00 a day, three days a week.

This may be an important way of breaking down the pay standards

of chemists as a whole. Still, it is better to keep these men in some form of income rather than throw them out on the courtesies of the Gibson Committee or other forms of charity. Forty per cent of the Gibson money is already gone. It is a question how much relief this committee can give.

When these men are thrown out, people should realize that chemistry is not a profession that has but $1^1/_2\%$ of unemployment. Many chemical heads are not aware of the existing situation; to these, someone should point out the desirability of making some compromise with the men in the industry.

We go to the heads of industry for contributions anyway. The men who are discharged come to us; and we go back to the industry for more money to give these men positions. They could be taken care of better by their own companies.

This, then, is the status of the work of the unemployment committee at the present time. I have tried to give you a picture of some of the problems that arise. Probably ways for working them out will arise from subsequent discussion and as we gain experience in handling the situation.

Positions Wanted

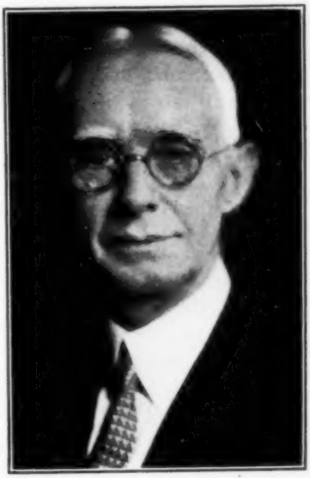
The following chemists are available for positions. Further information will be furnished upon application to the American Institute of Chemists, 233 Broadway, New York, N. Y.

101-XX	Chemist experienced in analysis of metals, rubber, paper. Some research experience.
101-QT	Ph.D. with wide experience in food products. Head of laboratories of various canning companies.
101-PQ	Chemistry professor. 15 years' teaching experience.
101-IN	Chemical engineer experienced in high vacuum and the chemistry of air gases.
101-ZN	Research and plant chemist experienced in cement, leather, high explosives, acids, fertilizers.
101-MO	Research chemist experienced in explosives, dye intermediates, acids.
101-HW	Paper chemist, research and development work.
101-DP	Recent graduate industrial position.
101-ID	Chemical engineer, nine years' experience plant work and management.
111-NQ	Chemist, 11 years' experience. Research analysis of metals.
111-OX	Organic chemist, experienced as chief chemist and director of research.

Charles H. Herty—Apostle to the South

By Florence E. Wall

The career of the medalist. A chemist who first improved the condition of his native South and who then fought to give the United States a declaration of chemical independence.



IN THE award to Dr. Charles Holmes Herty, industrial consultant of New York, of the medal of the American Institute of Chemists his many friends and professional associates and the country at large welcome one more occasion to do honor to a great chemist who is also more than a great man—a unique personality.

The singling out of this well known and well beloved fellow chemist presents the often needed opportunity to view in their proper perspective the work and achievements of someone that "everybody knows." Contrary to all known laws of perspective, however, as the beginnings of this man's life and work recede further into the background, his figure grows larger and larger, until now, in the light of his most recent achievements in the South, it looms gigantic—the member of the chemical profession who has had the greatest personal influence in the establishment of the chemical independence of the United States.

Since the critical days of the war, when this country was so seriously handicapped by the lack of imported chemical and medicinal supplies, Charles H. Herty has worked unceasingly for the development of chemical industry in America. It was a struggle in the beginning; but,

despite the disheartening indifference, the lack of understanding, and the blind opposition on every side, he clung tenaciously to his ideals until his private war for this newer phase of American independence was safely won.

DR. HERTY'S chosen mission as a bearer of good tidings to the South is in the nature of a glorified "return to the soil." He was born at Milledgeville, Georgia, on December 4, 1867, and grew up with every intention of succeeding his father as a druggist in his native town. He received his early education at the Georgia Military and Agricultural College, and went on to the University of Georgia, where he was graduated in 1886.

His parents had died before he was nine, leaving a legacy of $3000, with which the eighteen-year-old graduate wanted to buy immediately a half interest in what had been his father's drugstore. A wise ministerial guardian convinced him that he needed more education for such a chosen life work, and persuaded him to "invest the money in the top of his head" at the Johns Hopkins University.

The deterred would-be druggist took this advice, and went directly to Ira Remsen with the announcement that he would like to take about a year at Johns Hopkins "and polish off his knowledge of chemistry." With a perfectly straight face, the great teacher turned him loose in the laboratory for work on some preliminary experiments, which might give some idea of the ambitious new student's ability. After a week or so, Herty sought out Remsen to express his conviction that he actually knew nothing and wanted to start at the very beginning. The answer was a hearty, good-natured laugh, and Remsen's interested planning of a four years' course toward a doctor's degree.

Herty devoted this study principally to chemistry, mineralogy, and geology, and received his Ph.D. degree from the Johns Hopkins University in 1890.

Dr. Herty's first position was as an assistant chemist for the Georgia State Experimental Station, but in 1891 he returned to the University of Georgia to teach chemistry.

In 1899, he applied for a leave of absence and spent two years in Europe at the Universities of Berlin and Zurich. The comments of his European professors regarding the wasteful methods practiced in the American naval-stores industry brought him to a startling realization that there were serious research problems to be solved right in his own back yard. He returned to the States with this as his first Great Cause.

In 1902, he resigned his teaching position to follow this work on the conservation of turpentine pines with the United States Bureau of Forestry, and held the position of expert with this bureau for two years.

The story of the Herty Turpentine Cup, and the manner in which it revolutionized the turpentine industry soon made history. Ten years had been the conservative estimate of the time that it might take to gather the necessary data and effect the improvements that were so badly needed; but Dr. Herty's accumulated knowledge was so vast and so pertinent that within seven months he knew what was the matter and what to do about it.

The original source of the spirits of turpentine and rosin that constitute a great portion of the naval-stores industry was the longleaf pine forests of eastern North Carolina. This region constituted only one part of the unbroken pine forest which had formerly extended from Virginia all along the Atlantic and Gulf coasts as far as Texas. A steadily increasing demand for turpentine and rosin in the arts and manufactures led to enormous growth of the industry, and the consequent destruction of the pine forests caused its center to be pushed farther and farther south and finally westward. The old box system of gathering the turpentine caused an appalling waste, both in the weakening of the producing trees themselves and, what was more serious, in the destruction by fire of whole tracts of new growth. Secure in the popular belief that the supply was inexhaustible, no one had seemed to care about this serious depletion of a valuable natural resource; but in 1901 when the Turpentine Operators' Association was organized, the end was actually within estimable sight.

From his study of conditions and methods both here and abroad, Dr. Herty evolved a very practicable and efficient method of gathering turpentine. This consisted in the attachment of a cup-and-gutter arrangement for the collection of the resin, and a light chipping of the trees, instead of the destructive "boxing." The customary difficulties, objections, opposition, and indifference delayed developments for a while, but they only fired the inventor's zeal. He foresaw only success, but admits that he does not know how long it might have been withheld "if," as he tells it, "a left-handed nigger hadn't picked up a right-handed axe" to deal his scarring blow on a tree trunk. It thus became possible to fasten the gutters securely to the trees; the collecting cups were hung on *zinc* nails (another Herty idea) and the results of the reform were so successful that Dr. Herty resigned his government post to devote his time and enthusiasm to the successful manufacturing of his cups with the Chattanooga Pottery Company.

The year that followed could constitute a whole absorbing chapter in itself. When the wise ones regretfully decided that the cup was just not feasible, did Dr. Herty pack up and go home? He did not. He armed himself with a good sharp file and let himself into the plant in the dead of night, positive that if he could only get at the steel mould and "fix it up a little" with some nice deep gashes to hold the clay, all would be well. It was; and the once scorned "flower pots without holes" have since been sold by the hundreds of millions.

IN 1905, when the University of North Carolina offered Dr. Herty the chair of chemistry, he returned to teaching. During the eleven years that followed, he distinguished himself by his progressive and practical ideas on chemistry, and in 1908 he was made dean of the School of Applied Science. The State was then very backward, with no industrial activity except in fertilizers and cotton and with no funds whatever for industrial research. Dr. Herty made research his next Great Cause and spared none of his students in his efforts to instil in them the love of research in pure and applied science.

Throughout his teaching career, Dr. Herty stood out as an *educator* in the truest sense of the word. He believed sincerely in the value of a well-rounded life, and wherever he went, he always brought back to his students a full account of meetings and other activities, so that they too might feel the inspiration of valuable outside contacts. He was an automobile enthusiast—a *rara avis* on the college campus of those days—and delighted in piling a crowd of his boys into his car every Saturday so that they might visit a neighboring fertilizer plant and enjoy some of the outdoors.

He had always been interested in athletics and an outdoor life. He cheerfully admits that he was nearly expelled from preparatory school for being "no-account and trifling"—but a school-teacher aunt persuaded him to mend his ways, and he finished the same year at the head of his class. Later, at Johns Hopkins, when Remsen chided him for the amount of time he spent on extra-curricular activities—baseball, glee club, minstrel shows, and what-not—Herty said he wanted to teach college chemistry and needed the undergraduate's viewpoint. Remsen must have been surprised at the clever "alibi" at the time, but years later he admitted that he had come to see the wisdom of it.

It was Charlie Herty who, while he was teaching at the University of Georgia, introduced football to the South; in fact, he produced from somewhere the first oval football that had been seen on the campus. He likes to recall that he was the cheer leader for the team on which

Dr. John H. Finley played guard. He still has interests far removed from chemistry and counts three definitely recognized hobbies—baseball, billiards, and quail-hunting—for which he will "play hookey from work" at any time.

As director of athletics at North Carolina, Dr. Herty always encouraged a love of sports, and a spirit of *cameraderie* among his students. Many of "Cap'n Charlie's" boys will remember how he routed them from the laboratories, where they loved to spend their days and nights, and sent them out for fresh air and exercise.

His boys will also remember his devotion to the college and to his department. Legend has it that he turned most of his salary as professor back to the department in the form of needed books and periodicals. And who could ever expect to be remembered as the Perfect Professor without revealing at least one bit of evidence of the traditional absent-mindedness? Legend has it again that there may still be stowed away in the university laboratory a mess of mixed resin acids that "Cap'n Charlie" *always meant* to send away somewhere on the chance that it could be utilized in the manufacture of phonograph records. But he always forgot to bring the jars! It is not legend, however, that with his passion for efficiency and accuracy, he always kept his pet *Home Run* cigarettes spread out in a huge desiccator, over a certain salt solution, so that their humidity would always meet the requirements of his fastidious taste.

FOLLOWING his rise to national prominence, Dr. Herty was elected President of the American Chemical Society, and held the post for the two critical war years of 1915 and 1916. He sounded the keynote of his future work in his first presidential address, when he urged the closer cooperation of pure and applied chemistry, and insisted that the primary aim of both was the uplift of humanity.

His work during those two terms was indefatigable. He was active in establishing the first Exposition of Chemical Industries (1915), and in the face of disheartening indifference, procrastination, and opposition finally succeeded in arousing the chemists of the country to some sense of national responsibility. With keen foresight, he advocated the purchase of supplies sufficient to last until American plants could assure their manufacture to meet the demands; he fought for a high protective tariff on dyes and medicinals from coal tar; and finally undertook a census of the chemical man-power of the country, so that the government could have tangible facts on its actual possibilities.

Upon completion of his second term as President of the American

Chemical Society, Dr. Herty was chosen by the Society as editor of its official organ, the *Journal of Industrial and Engineering Chemistry*. During his five years in this position, he worked ceaselessly to educate the public to the importance of chemistry; to stimulate the manufacture of dyes and synthetic organic chemicals; and to enlighten Congress on the urgent necessity of adequate protection for new industries so that the United States could be economically independent of foreign sources of supply. He helped in the organization of the Chemical Warfare Service as an integral and basically important branch of the army.

After the war (1919) President Wilson sent him to Paris to negotiate with the reparations authorities for the purchase of impounded stocks of German dyes and chemicals to make up the deficit in the needs of this country. He arranged for the purchase and importation of these supplies through the Textile Alliance, Inc., an organization of consumers, and thus protected American consumers from exorbitant prices.

In 1921, the Synthetic Organic Chemical Manufacturers' Association was formed, and Dr. Herty was elected its first president. The fight for the tariff was continued, and finally won, and his constructive leadership was a most important factor in placing chemical industry in its present favorable position. In October of the same year, just after the unanimous decision of the United States Supreme Court had finally vindicated the activities of the Chemical Foundation, Dr. Herty became associated with that organization. From 1926 to 1928 he served officially as its adviser, and still devotes some of his time to its interests. Through this mutual cooperation, the good work of public education in chemistry has gone on unabated, and the significance of chemistry in public health has grown in importance. In this connection he served as permanent chairman of a committee of the American Chemical Society on an Institute for Chemico-Medical Research, from its inception until the passage of the Ransdell Bill in May, 1930, assured the establishment of the National Institute of Health.

SINCE 1928 Dr. Herty has maintained offices as an industrial consultant. From his battles for the good of the chemical industries of the entire country, his interests have turned once more to the industrial problems of his beloved native Southland.

Remembering the turpentine problem, and conscious of the economic danger of exhausting resources in one-crop regions, he started to preach his gospel of research for new development. Before every type of organization, he talked, pleaded, and exhorted for interest and co-

operation in the infinite possibilities of new chemical industries, so that the Southeast need not be dependent on its naval stores and its cotton.

In glowing terms, he painted the fascinating pictures of farm relief through chemistry and the utilization of waste products. He showed also that the staple industries need not be considered as mere ends in themselves, but that the by-products of cotton and of the naval stores can be made to contribute most profitably to regional sources of revenue. He talked of cotton, peanuts, and trees, not as commodities in themselves, but as sources of cellulose, for which there seems to be an insatiable demand.

And then dawned the Greatest Cause—the development of a paper industry from "slash pine." For years Dr. Herty had heard that paper could not be made from slash pine "because it contains too much resin." He made no pretense of being a pulp and paper man, but his common sense rejected any attempt to make him believe that something is just not to be tried because of ancient notions that it has always been impossible.

Perhaps it was due to some slight trace of professorial absent-mindedness—surely to be condoned in one with so many interests—or perhaps it was due to the steady impinging on his subconscious memory of something that had passed casually through his mind years before, but Dr. Herty suddenly remembered a framed drawing that has hung on the wall of his office for years and years. In 1903, Professor Adolph Tschirch of the University of Bern, Switzerland, had suggested that the formation of resin in the flow of turpentine from pine trees is a pathological rather than a natural physiological process. He drew several sketches to illustrate his theory that resins, as such, do not exist in the living tree, but are formed as a protection for the scarred surface after the tree is wounded.

FIRED with enthusiasm to test this theory, which had been forgotten for nearly a generation, Dr. Herty commenced to ask for facts on the alleged resin content of slash pine, and soon learned that no one knew either just how much resin actually is in the pine or what, if anything, could be done to get rid of the resin without injuring the wood fibres.

There was a flourishing crop of this Cuban pine ("slash" is Georgian for *swamp*)—the most prolific and the fastest growing of all pines—going simply unheeded. The practical mind of the industrial chemist summarily rejected the inherited notions of what could not be done, and sought definite information on actual causes and effects.

Dr. Herty enlisted the aid of those best calculated to give him the needed assistance and found that the resins supposed to be present in formidable amount in the slash pine were, in fact, so low in percentage as to be negligible for the practical purposes of paper making.

In view of the venerable popular superstitions, the facts seemed almost incredible; but they proved conclusively that a very good grade of paper pulp can be manufactured from young slash pine growth. It can be bleached very economically, and can be successfully used for newsprint.

Dr. Herty soon had ample evidence that with careful conservation and reforestation, the slash pine region of the South could be made to furnish the whole nation with newsprint. He traveled everywhere, trying to arouse interest in the project, met with high interest and enthusiasm, but only indifferent cooperation, and no promises of the financial aid that was a necessity for the establishment of a new industry. Finally, a grant of $50,000 was offered by the Chemical Foundation, with the proviso that the State of Georgia appropriate an additional $20,000 annually over a period of five years. This has already been done for 1932 and 1933, and a plant has actually been in course of construction at Savannah since January 2nd of this year, with Dr. Herty in charge.

Another Great Cause on the way to completion! And as soon as its future is assured, its sponsor will have numerous other suggestions for those who want to take an active part in the economic rehabilitation of the South. Already he sees them in a vision—fruits frozen with carbon dioxide from the limestone, beautiful face brick from the clay, utilization of undeveloped mineral resources—and doubtless more, after these are on their feet and going.

WITH all his professional activity, Dr. Herty has many interests. He was elected a Fellow of the American Institute of Chemists in 1926. Besides the American Chemical Society, his memberships include: the American Association for the Advancement of Science; American Electrochemical Society; American Forestry Association; American Institute of Chemical Engineers; American Philosophical Society; Chemical Society (London); Franklin Institute; Society of American Foresters; Society of Chemical Industry (British); Société Chimique de France; Société de Chimie Industrielle; and the Technical Association of the Pulp and Paper Industry. He is also a member of Phi Beta Kappa; Sigma Xi, Alpha Chi Sigma, and Kappa Alpha (Southern). His clubs are the Century Association and The

Chemists' Club of New York; and the Cosmos Club of Washington, D. C.

In 1895, during his teaching days at the University of Georgia he married Miss Sophie Schaller, of Athens, Ga., who died in 1929. Their three children are Dr. Charles Holmes, Jr. (M. I. T.), a recognized authority on the physical chemistry of steel-making, formerly with the Pittsburgh Bureau of Mines and now continuing this work at the Carnegie Institute of Technology under a cooperative arrangement with the steel industry; Frank, with the Brooklyn Union Gas Co.; and Dorothy, a sophomore at Vassar, winning laurels as "father's own daughter" in the botany department.

DR. HERTY'S whole life has been an example of "noteworthy and outstanding service to the science of chemistry and the profession of chemist in America." He has always been a man of single purpose, not in any remote resemblance to the "single-track-mindedness" of the modern specialist, but in the zeal with which he works toward the accomplishment of one worthy cause at a time. With an unfailing diagnostic eye and sure touch, he can put his finger on the cause of economic trouble, work out a remedy for its cure, and hand over the prescription. But from that point on, he wants his composite patient to take care of his own return to health, while he goes on to another case.

The simple text of Dr. Herty's gospel to the South is "Help Yourself!" He wants to serve as a spiritual philanthropist who, instead of doing things for his people, prefers to show them how they can do things for themselves. He sees in his native State untold opportunities for future development; and to the accomplishment of these constructive peace-time plans for the South he willingly lends all the energy and indomitable zeal that effected the realization of his war-time efforts for the industrial independence of the whole nation.

Summer Session at Hopkins

Noted chemists will contribute to conferences on "Recent Developments in Chemistry." An opportunity for the entire chemical profession.

AN INNOVATION in the conduct of the summer session of The Johns Hopkins University chemistry department will provide this year a unique opportunity for teaching and industrial chemists to confer with authorities of national and international repute in a series of courses that will be worked out as conferences on the research phase of the science. These courses will be planned to suit the convenience not only of persons registering for the full session, but also of those on limited leave.

In addition to the regular theoretical and laboratory courses in general, physical, organic, and analytical chemistry, a series of conferences on "Recent Developments in Chemistry" has been arranged in weekly sections, to be conducted by members of the Hopkins faculty. An important feature will be lectures by visiting specialists, such as Dr. Claude S. Hudson of the National Institute of Health, Dr. Phoebus A. Levene of the Rockefeller Institute of Medical Research, and Professor Harold C. Urey of Columbia University, whose past and present researches are notably developing their respective fields and gaining for them extensive recognition throughout the profession.

By a special arrangement it will be made possible for a teacher or industrial worker to register for as short a time as one week's conference, if his inclinations or convenience preclude his attendance at the entire course. Such registration will be at the nominal fee of five dollars per week. Any student regularly registered in the summer session may take this series of conferences as a graduate credit course without additional charge.

The schedule of conferences is as follows:

June 27th–July 1st. "Raman Effect and Problems in Molecular Structure." Directed by Dr. D. H. Andrews.

Current problems in molecular structure will be discussed, particularly in the light of evidence from Raman spectra and band spectra in the infra-red and visible regions. Some demonstrations of experimental technique will be given, and the use of these spectra as tools in chemical

CHEMISTRY BUILDING, JOHNS HOPKINS UNIVERSITY

research will be emphasized. The week will close with a general discussion grouped around papers by the invited lecturers: Professor Harold C. Urey, Columbia University; Dr. Oliver R. Wulf, Fixed Nitrogen Laboratory, Washington, D. C.; Dr. John R. Bates, Princeton University; Dr. Henry Eyring, Princeton University.

July 5th–9th. "Colloidal Chemistry." Directed by Dr. W. A. Patrick. The conferences will include a general discussion of the recent theories on colloidal behavior and their applications to adsorption and other colloidal phenomena of importance in nature and in the industries. A special lecture will be given on "The Colloidal Behavior of High Polymers" by Dr. Elmer O. Kraemer, E. I. du Pont de Nemours & Company, Wilmington, Delaware.

July 11th–15th. "Catalysis." Directed by Dr. J. C. W. Frazer. The conferences will take up recent developments in the field of catalysis, and their application to industrial processes, etc., as shown by the following outline:

July 11th and 12th. Dr. J. C. W. Frazer, chairman of the chemistry department at Hopkins, will lecture on "Structure of Catalysts: State of Adsorbed Molecules; Mixed Catalysts; and Poisoning of Catalysts."

July 13th. Conference will be led by Dr. A. B. F. Duncan of the Hopkins chemistry department. He will take up "Absorption of

Gases or Solids; Form of Adsorption Curves; Heat of Adsorption; and Activation Energy of Adsorption and Rate of Adsorption."

July 14th. Dr. Louis S. Kassel of the U. S. Bureau of Mines, Experimental Station, Pittsburgh, Pennsylvania, will lead the conference on "Heterogenous Reactions," in connection with which he will bring up reaction mechanisms—intermediate products; chain reactions from heterogenous reactions; and quantum theory of activation energy.

July 15th. Dr. Paul H. Emmett of the Fixed Nitrogen Laboratory, Washington, D. C., will speak on "The Catalytic Formation of Ammonia and Other Work of the Fixed Nitrogen Laboratory."

July 15th. Dr. A. T. Larson, du Pont Ammonia Corporation, Wilmington, Delaware, will lecture on "The Methanol Synthesis."

July 18th-29th. "Relation of Properties to Constitution of Organic Compounds." Directed by Dr. E. Emmet Reid.

Theoretical discussion. July 18th-22nd. The relation of structure to physical properties, melting and boiling points, optical activity, etc., and to such chemical properties as reactivity.

July 18th. Dr. E. Emmet Reid will give a lecture on the "Introduction to the Week's Work."

July 19th. Dr. E. Emmet Reid will have a conference on "Free Radicals" and will be assisted by Dr. F. O. Rice's students. This conference will comprise a study of the original method of Paneth and coworkers for the preparation of free methyl and ethyl groups. It will be followed by a study of the methods developed by Dr. F. O. Rice in the laboratories of The Johns Hopkins University. The mechanism of the decomposition of organic molecules will also be discussed, especially from the standpoint of free radical formation.

July 20th. Dr. M. S. Kharasch, Professor of Organic Chemistry, University of Chicago, will lead the conference on "The Use of the Electronic Theory in Elucidating Reactions in Organic Chemistry."

July 21st. Dr. P. A. Levene, research chemist, the Rockefeller Institute for Medical Research, will lecture on "Chemical Structure and Optical Activity."

July 22nd. Dr. C. S. Hudson, Professor of Chemistry, National Institute of Health, will lecture on "An Extension of Emil Fischer's Proof of the Configurations of the Sugars."

Application. July 25th-29th. The designing of organic compounds for specified purposes, as illustrated in chemotherapy and in the arts.

July 25th. Dr. E. Emmet Reid will give an "Introduction to the Week's Work."

July 26th. Dr. David I. Macht, Director of Pharmacological Research Laboratory, Hynson, Westcott & Dunning, Baltimore, Maryland, will speak on "The Present Status of Possibilities and Limitations in Regard to the Relationship between Chemical Structure and Physiological Action."

July 27th. Dr. H. J. Barrett, Research Chemist, E. I. du Pont de Nemours & Company, will give a lecture on "Relation of Resin Formation to Structure."

July 28th. Dr. H. A. Lubs, Assistant Director, Jackson Laboratory, E. I. du Pont de Nemours & Company, Wilmington, Delaware, will lecture on the "Relation of Color to Constitution in the Thioindigoid Dyes."

July 29th. Dr. R. E. Rose, Director of Laboratory and Research, E. I. du Pont de Nemours & Company, Wilmington, Delaware, will speak on "The Relation of Structure to the Color of Dyes."

Other Interesting Features of the Session

Another course of the Hopkins summer session of particular interest to chemistry teachers will be the course in Undergraduate Curriculum Content. This will be worked out with a view to the development of an improved curriculum for undergraduate chemistry students and will be conducted to some extent in connection with the conferences on "Recent Developments in Chemistry." Attendance at the latter will not be required, but will be encouraged as providing an invaluable opportunity for teachers to select at first hand and to organize material from up-to-date developments.

Registrants in the course on the History of American Chemistry will have the privilege of conferring with Dr. C. A. Browne, Chief, Chemical and Technological Research, Bureau of Chemistry and Soils, Washington, D. C., one of the most prominent authorities in this field.

The following sound films will be presented as public lectures during the summer: June 30th, "Cosmic Ray" by Dr. R. A. Millikan, director, California Institute of Technology, Pasadena, California; July 14th, "Oil Films on Water" by Dr. Irving Langmuir, Assistant Director, Research Laboratory, General Electric Company, Schenectady, New York; July 28th, "Some Biochemical, Pharmacological, Medical and Experiences as Told to Chemists" by Dr. J. J. Abel, Professor of Pharmacology, The Johns Hopkins Medical School, Baltimore, Maryland.

BY-PRODUCTS

Standardization

UPON reflection we discover that our views upon this concept are asymptotic with heresy, which tempts us to foster them. We confess entertaining a number of psuedo-heretical opinions. Indeed, as things are, if one wishes to indulge in independent thinking it is difficult to escape heresy in premise or conclusion. The mass mind, if such there is, thinks mass thoughts—assuming that it thinks at all, which is only a modern way of saying that most people get their opinions ready-formed from someone who can dissemble the fact that he is the only one doing the thinking. Opinions gained this way, in childlike innocence of the logic on which they are based, are usually embedded in the emotional field, and contrary or hostile opinions commonly provoke an emotional rather than an intellectual response. Which is probably the reason why heretics are cremated and not refuted.

One of our pet heresies concerns standardization. Throughout recorded history each age has been characterized by some shibboleth. With the Greeks, beauty; with the Romans, administration; to the Teutonic barbarians, loot (which still survives); in Feudal times, power (which also survives); in the Middle Ages, truth (long since perished in want); then exploration, conquest, colonization, organization, progress, and now standardization. This list is remarkable for scarcity of intellectual and the preponderance of materialistic aims.

We rise in the morning at a standardized time from a standardized bed and bedding, draw on standardized socks and standardized trousers, put our feet into standardized shoes, shave with a standardized razor, brush our sometimes standardized teeth with a standardized toothbrush in a standardized fashion, adjust a standardized necktie in a standardized collar to a standardized shirt, dropping a standardized collar-button on a standardized rug and saying standardized things about it... but why labor the point? Before we sit down to our standardized breakfast, we have thoroughly standardized ourselves. If this keeps on, we shall soon be able to predict for the new born babe every detail of his standardized life from synthesis to analysis.

Standardization makes mass production possible; mass production makes machine manufacturing possible; machines make unemployment possible, which makes depressions possible, which makes standardized charity necessary.

Even the racketeers, who seemed to be our one evidence of independent originality, are standardizing their methods. This will make it easier for the standardized police force.

About the only unstandardized thing left is the gold standard.

The Einstein Effect

"Young man," said Professor Phaserule, adjusting his spectacles to a more impressive position, "what is this mass of twaddle you are trying to tell me? The results of your laboratory—ahem—work indicate a degree either of carelessness or incompetence for which I find no parallel in all my years of teaching experience. And yet you attempt to justify such utterly discordant figures and argue that I have been—ahem—hasty, not to say uncomprehending, in marking you failure?"

"My dear Professor!" expostulated the youth patiently, albeit a little wearily, "must we go all over that again? Can't you understand that I am an Einsteinian human—my time and actions depend upon the axis of reference with which I correlate them? Now, for instance, while you are teaching 1932 chemistry according to your time-reference, I am really studying 2132 chemistry, which differs somewhat from your type. And, of course I'm young and only human and sometimes get my reference-frames mixed in the laboratory. Eventually I shall learn to control the—better. Meanwhile—"

"Young man!" cried the aroused professor, "Einstein refers to physics, not to chemistry, thank heaven!"

"You're right, according to 1932," soothed the student, "but think of 2132."

"Now that sulphate determination—," interrupted the professor, anxious to change the subject.

"Oh, that," sighed the youth. "Well, the explanation of that presents no difficulties. The first determination proceeded normally under Newtonian conditions and gave what you would regard as the correct answer. But during the second I got my frames mixed, and the weight of the barium chloride changed after I had dissolved it!"

"Probably spilled some of it," growled the professor.

"Not at all, because I got too much $BaSO_4$ for 1932, but the correct amount for 2132."

"Lead in the sulphuric acid," snapped the professor. "How many times must I tell you students to test your reagents?"

"Oh, no," contradicted the youth. "That couldn't be it, because the barium sulphate precipitated before I added the sulphuric acid. I—"

"What?" roared the professor, "did I understand you to say..."

"Exactly," replied the student patiently. "I was operating under an unusual frame in which temporal relationships are somewhat incongruous to an historical intelligence."

Prof. Phaserule suspected the respectfulness of this remark but chose to ignore it. He smiled quietly and asked,

"Then why not withhold the sulphuric acid altogether and just weigh the barium sulphate? That would save reagents."

"Can't be done. The precipitation makes the addition of the acid deterministically necessary. When the precipitation occurred, no power on earth could prevent the addition of the acid. If one achieves the effect he must perfect the cause."

"This is quite immaterial, young man. The fact remains that you have failed to perform satisfactorily the work of this course."

"I regret your unsympathetic attitude," murmured the youth sadly. "Now, Berzelius seems to grasp the idea very well, although Dalton is a bit reserved about it. I haven't convinced him yet."

"Berzelius! Dalton! Are you sure you are feeling quite well? Have you consulted a physician lately?"

"Oh, I'm all right that way," reassuringly. "Berzelius and Dalton are on the 1832 frame, as I was telling Faraday this morning. It's only a matter of choosing the proper reference-axis."

"Faraday!"

"Yes, I've got him interested in heading off electromagnetic waves and traveling through them in reverse order. He had found some interesting phenomena and is having quite a bit of discussion with Clerk Maxwell about their effects on the second law. Tried to interest Clausius, but he is very obstinate. Seems to be afraid of reversible entropy."

"Yes, yes, to be sure, just so," purred the professor with staring eyes. "Now you run along and I'll go over your papers again and see what can be done."

The youth shook his head gloomily and dragged his feet out of the room.

Prof. Phaserule was 'phoning the Dean. "No, not violent, just—ahem—under delusions... seems to think he's Einstein... His

physics courses must have unbalanced him... Would strongly recommend... medical attention... Yes, he flunked Chem. 4... Yes, immediately...."

Attitude

One who has spent several years in college training himself for a career and has then spent a decade or two scrimmaging with practical life will, if he is at all reflective, occasionally take stock of himself and of other college men in comparison with acquaintances who lack academic benefits. His conclusions in certain directions are likely to indicate deficiencies in our educational systems and lead to criticisms of colleges and teaching staffs. Perhaps we habitually expect more from institutions of learning than, in the nature of things, is possible to obtain; but this in itself is rather stimulating than depressive.

It is illogical but very human to compare successful "self-made" men with college-bred failures; and at least one point may be demonstrated by the comparison. A large factor in the matter of success consists in the attitude toward life in general which characterizes the given individual. A few men may be born with an intuitive knowledge of the optimum approach to the complex conditions and activities of life, but most men have to learn by experience. Maxims and wise counsel offered by one's elders may be of great assistance if they are comprehended and if one knows how to apply them. A congenitally stupid individual, with or without collegiate training, fails to profit from experience, in proportion to his inability to analyze it and draw the logical conclusions. The intelligence necessary to accomplish these things depends upon native wit which comes into being with the individual and which can be developed but not created.

At most, then, all that we can demand of our colleges is that they develop the intelligence of their students, since they cannot be expected to implant intelligence in sterile soil. Knowledge, a passable accumulation of facts, may be packed into a student's head much as one might store merchandise in a warehouse; but unless the capacity to use it is developed at the same time, knowledge will remain only an impediment.

In the hands of a wise man a little knowledge of a few facts and principles serves to ensure success, because his actions are inspired by a proper attitude toward life. He instinctively does the right thing all of the time and prospers. The fool getteth not the idea and perisheth. But the fault is not with the college from which the fool may have been graduated.

— *The Autocratic Chemist*

Michael Faraday*

1791-1867

"The man who made electrical engineering possible"

A selected list of books and periodical literature appropriate to the Centenary of Faraday's discovery of electromagnetic induction, September 24, 1831. Reprinted by courtesy of the Pratt Institute, Brooklyn, N. Y.

Biographical

APPLEYARD, ROLLO

A Tribute to Michael Faraday. 1931.

Unusually interesting in detail and appreciation.

ASHCROFT, E. W.

Faraday. 1931.

Especially prepared for the Faraday Centenary, under the auspices of the British Electrical and Allied Manufacturers Association.

CRAMP, WILLIAM

Michael Faraday and Some of His Contemporaries. 1931.

CROWTHER, J. A.

The Life and Discoveries of Michael Faraday. 1918.

DE LA RIVE, A.

Michael Faraday—His Life and Works. *Smithsonian Institution, Annual Report.* 1867. Vol. 22, pp. 227-245.

Interesting, because written by one who was his contemporary, and knew him personally.

Faraday Celebrations. 1931.

"Plans of Celebration." *Journal of Chem. Ed.*, July, 1931. Vol. 8, pp. 1442-1446.

Facsimile and transcript of a page from Faraday's diary.

GINZBURG, BENJAMIN

Faraday and Maxwell: The Science of Electro-Magnetism. (In his *The Adventure of Science.* 1930. Pp. 219-252.)

GLADSTONE, J. H.
Michael Faraday. 1872.

JONES, H. B.
The Life and Letters of Faraday. 2 vol. 1870.
Standard, written by his friend who was in close touch with his work as fellow and secretary of the Royal Institution from 1845.

NEWELL, L. C.
Faraday's Contributions to Chemistry. *Journal of Chem. Ed.*, Aug., 1931. Vol. 8, pp. 1493–1522, ill.
Exceptionally interesting account of Faraday's work in chemistry.

O'REILLY, M. F., and WALSH, J. J.
Faraday.
(In their *Makers of Electricity*, 1909. Pp. 298–333.)

ROBERTSON, SIR ROBERT, and ELLIS, B. A.
Faraday's Chemical Manipulation. *Nature.* Aug. 29, 1931. Vol. 128, pp. 371–372.

RUSSELL, J. S.
Faraday, a Discoverer. *Macmillan's Magazine.* 1868. Vol. 18, pp. 184–191.
Review of Tyndall's life of Faraday.

SMITH, E. C.
Faraday and His Contemporaries. *Nature.* Aug. 29, 1931. Vol. 128, pp. 333–336.

THOMPSON, S. P.
Michael Faraday; His Life and Work. 1898.
Excellent estimate of Faraday's life and work.

THORPE, T. E.
Michael Faraday—a review of Dr. Bence Jones' Life and Letters of Faraday. *Manchester Guardian.* 1870. (In his Essays in historical chemistry. 1902. Pp. 185–205.)

TYNDALL, JOHN
Faraday as a Discoverer. 1884.
Very complete account of Faraday's experimental work, and some personal reminiscences.

Appreciations

"The greatest experimental philosopher the world has ever seen."

—TYNDALL.

ARMSTRONG, H. E.

Faraday's Worth in Wisdom. *Nature*. March 14, 1931. Vol. 127, pp. 395–396.

BRAGG, SIR WILLIAM

Michael Faraday, the Man Who Made Electrical Engineering Possible. *Illustrated London News*. Sept. 19, 1931. Vol. 179, p. 444.

BROWN, F. C.

The Work of Faraday and Henry. *Scientific Monthly*. Nov., 1931. Vol. 33, pp. 473–480.

Faraday and the Benzene Centenary.

Engineering. June 19, 1925. Vol. 119, p. 770.

The Faraday Celebration.

Chemistry and Industry. Sept. 11, 1931. Vol. 50, p. 747.
Electrician. Sept. 25, 1931. Vol. 107, pp. 396–400.
Engineer. Sept. 25, 1931. Vol. 152, pp. 326–327.
Engineering. Sept. 25, 1931. Vol. 132, pp. 415–417.

The Faraday Centenary.

Chemistry and Industry. June 5, 1925. Vol. 44, p. 575.
Bell System Technical Journal. Supplement. October, 1931.

The Faraday Exhibition.

Chemistry and Industry. Oct. 9, 1931. Vol. 50, p. 831.
Engineer. Sept. 25, 1931. Vol. 152, pp. 328–330.
Engineer. Oct. 2, 1931. Vol. 152, pp. 348–349.

Faraday Memorial.

The Electrician. Oct. 19, 1928. Vol. 101, p. 437.

Faraday's research on metals anticipated modern steel.

Science News Letter. Sept. 26, 1931. P. 195.

HARTLEY, SIR HAROLD

Michael Faraday and the Theory of Electrolytic Conduction. *Chemistry and Industry*. Oct. 2, 1931. Vol. 50, pp. 807–815.

HEDGES, E. S.

Faraday's Views on Passivity in the Light of Recent Research. *Chemistry and Industry*. Sept. 11, 1931. Vol. 50, pp. 750–751.

HOFMANN, A. W.

The Life-work of Liebig—The Faraday lecture for 1875. 1876. Pp. 3–5, 12–13, 141–145.

Contains a delightful letter written by Faraday to an inquiring lad. (F. O. Ward.) P. 144.

MARSHALL, ARTHUR

Faraday's Researches in Electrochemistry. *Chemistry and Industry.* Sept. 11, 1931. Vol. 50, pp. 749–750.

MINSHALL, T. H.

Faraday and Modern Electrical Developments. *Engineer.* Sept. 4, 1931. Vol. 152, pp. 237–238.

MITCHELL, TERRY

Faraday—Genius of the Dynamo. *Power Plant Eng.* July 15, 1931. Vol. 35, pp. 756–758.

POPE, W. J.

Faraday as a Chemist. *Chemistry and Industry.* June 19, 1925. Vol. 44, pp. 630–634, 653–655.

Science pays tribute to Faraday.

Power. Sept. 22, 1931. Vol. 74, pp. 415–417.

International Significance of Faraday

Austria

PRZIBRAM, KARL

Faraday and Austria. *Nature.* Aug. 29, 1931. Vol. 128, pp. 351–352.

Bohemia

BRAUNER, BOHUSLAV

The Faraday Festival. *Nature.* Aug. 29, 1931. Vol. 128, pp. 352–353.

Denmark

MEYER, MRS. KIRSTINE

Faraday and Oersted. *Nature.* Aug. 29, 1931. Vol. 128, pp. 337–339.

France

BRUNET, PIERRE

Faraday and French Physicists. *Nature.* Aug. 29, 1931. Vol. 128, pp. 346–348.

Germany

SCHAEFER, CLEMENS

Gauss' Investigations on Electro-dynamics. *Nature.* Aug. 29, 1931. Vol. 128, pp. 339–341.

Holland

ZEEMAN, P.

Faraday's Researches on Magneto-optics and Their Development. *Nature.* Aug. 29, 1931. Vol. 128, pp. 365–368.

India

RAMAN, C. V.

India's Debt to Faraday. *Nature.* Aug. 29, 1931. Vol. 128, pp. 362–364.

Italy

VOLTERRA, VITO

Italian Physicists and Faraday's Researches. *Nature.* Aug. 29, 1931. Vol. 128, pp. 342–345.

Norway

BJERKNES, V. K. F.

Dynamic Aspects of Electromagnetism. *Nature.* Aug. 29, 1931. Vol. 128, pp. 369–371.

Russia

MITKEWICH, W. T.

Faraday and Electrical Science in Russia and the U. S. S. R. *Nature.* Aug. 29, 1931. Vol. 128, pp. 359–362.

Switzerland

GUYE, C. E.

Faraday's Connection with Switzerland and Swiss Industrial and Economic Development. *Nature.* Aug. 29, 1931. Vol. 128, pp. 349–351.

United States

KENNELLY, A. E.

The Modern Electric Age in Relation to Faraday's Discovery of Electro-magnetic Induction. *Nature.* Aug. 29, 1931. Vol. 128, pp. 356–359.

WHITNEY, W. R.

Faraday's Researches in the United States. *Nature.* Aug. 29, 1931. Vol. 128, pp. 353–356.

Works of Michael Faraday

Chemical Manipulation. 1827.
Only book, in the usual sense, published by Faraday.

A course of six lectures on the Chemical history of a candle. 1899.
Published by Sir William Crookes without Faraday's supervision.

Experimental researches in electricity. Reprinted from the *Philosophical Transactions* of 1831–1838. 3 vols. 1839.
Particularly valuable because of prefaces by Faraday himself.

Experimental Researches in Electricity. 1912.
Small selection from his experimental researches in electricity.

Experimental Researches in Electricity. (In Ames, J. S. ed., Discovery of induced electric currents. 1900. Vol. 2.)
A selection.

Faraday's diary: Being the various philosophical notes of experimental investigation made by Michael Faraday during the years 1820–1862. 7 vols. (In preparation.)

On the various forces of nature and their relations to each other. n. d.
Published by Sir William Crookes without Faraday's supervision.

Relation by measure of common and voltaic electricity: on electro-chemical decomposition. (See Goodwin, H. M. ed., *Fundamental Laws of Electrolytic Conduction.* 1899. Pp. 1–48.)

Developments Based on Faraday's Discoveries

This division can be only introductory and suggestive, as the whole of electrical engineering literature deals largely with those developments.

Alloys

Faraday and Steel Research. *Engineer.* Sept. 25, 1931. Vol. 152, p. 319.

Faraday exhibition. *Chemistry and Industry.* Oct. 9, 1931. Vol. 50, p. 831.

Dye Industry

Faraday Celebrations. 1931. "At the Sign of the Hexagon," Albert Hall. *Chemistry and Industry.* Sept. 18, 1931. Vol. 50, pp. 774–776.

Electric Generator

Electrician. Sept. 25, 1931. Vol. 107, pp. 410–413.

Electrochemistry

Faraday Exhibition. *Chemistry and Industry.* Oct. 9, 1931. Vol. 50, p. 831.

Modern Science

Faraday and Modern Science. *Electrician.* Sept. 25, 1931. Vol. 107, pp. 393–394.

Radio Communications

Electrician. Sept. 25, 1931. Vol. 107, pp. 418–419.

Telegraphy and Telephony

Electrician. Sept. 25, 1931. Vol. 107, pp. 414–417.

Illustrative Material

Illustrations of Faraday's Life and Work

Announcing his discovery to his wife on Christmas morning, 1821.
Scribner's. 1888. Vol. 3, p. 308.

Bookbinder's shop in Blandford Street.
Jones, H. B. Life and Letters of Faraday. 1870. Vol. 1, p. 9.

Early London home—Jacob's Well Mews.
Jones, H. B. Life and Letters of Faraday. 1870. Vol. 1, p. 7.

The electromagnet ring constructed by Faraday.
Ill. London News. Sept. 19, 1931. Vol. 179, p. 444.
Power. Sept. 22, 1931. Vol. 74, p. 416.
Scientific Monthly. Nov., 1931. Vol. 33, p. 477.

Hampton Court house where Faraday died.
Jones, H. B. Life and Letters of Faraday. 1870. Vol. 2, p. 339.

The laboratory in the Royal Institution.
Jones, H. B. Life and Letters of Faraday. 1870. Vol. 2. Frontispiece. *Power.* Sept. 22, 1931. Vol. 74, p. 416 (from a drawing).

Lecturing at the Royal Institution. (Prince Consort in attendance.)
Ill. London News. 1899. Vol. 114, p. 846.
Power. Sept. 22, 1931. Vol. 74, p. 417.
Science News Letter. Sept. 26, 1931. P. 195 (original painting by Alexander Blaikley).

Page from Faraday's laboratory notebook on which he recorded the results of his historic experiment on electromagnetic induction.
Bell System Technical Journal. Supplement. Oct., 1931. Pp. vi, vii.

Illustrated London News. Sept. 19, 1931. Vol. 179, p. 444.
Power. Sept. 22, 1931. Vol. 74, p. 416.
Scientific Monthly. Nov., 1931. Vol. 33, p. 476.

The study at the Royal Institution.
Jones, H. B. Life and Letters of Faraday. 1870. Vol. 2, opp. p. 1.

Portraits

Painting—Thomas Phillips, R.A., National Portrait Gallery, London.
Ashcroft, E. W.: Faraday. 1931. Frontis.
Crowther, J. A.: Life and Discoveries of Michael Faraday. 1918. Frontis.
Electrician. Sept. 25, 1931. Vol. 107, p. 395.
Power Plant Engineering. July 15, 1931. Vol. 35, p. 757.
"Faraday at about the age at which he made his most far-reaching discovery."

Daguerreotype by Caludet. Engraving by Adlard. Faraday at about fifty.
Tyndall, John: Faraday as a Discoverer. 1884. Opp. p. 89.

Negative—Engraving by Adlard.
Tyndall, John: Faraday as a Discoverer. 1884. Frontis.

Photograph by Maull and Polyblank, engraved by Adlard. Faraday in 1857.
Duyckinck, E. A. Engraving "of a recent photograph from life" (in his portrait gallery of eminent men and women. 1873. Vol. 2, opp. p. 173).
Jones, H. B. Life and Letters of Faraday. 1870. Vol. 1. Frontis.
Mounton, C. W., ed. Library of literary criticism. 1904. Vol. 6, p. opp. 511.
Illustrated London News. Sept. 19, 1931. Vol. 179, p. 444.

Scientific Monthly. Nov., 1931. Vol. 33, p. 474.
Scribner's. 1924. Vol. 75, p. 537.

Photograph by John Watkins, London.
Nature. Supplement. Aug. 29, 1931.
Scribner's. 1923, Vol. 73, p. 647.

Engraving by F. T. Stuart, Boston.
Eclectic. 1868. Vol. 63. Frontis.

Statuary

Bust in the Faraday Memorial Library, Walworth Road, Southwark, the London Borough in which Faraday was born.
Replica of marble bust in the Institution of Electrical Engineers, London. Unveiled Oct. 17, 1928.
Electrician. Oct. 19, 1928. Vol. 101, p. 437.
Electrician. Sept. 25, 1931. Vol. 107, p. 427.

Statue in hall of Royal Institution, London.
(Engraved by J. H. Foley.)
Illustrated London News. 1877. Vol. 70, p. 233.
Illustrated London News. 1899. Vol. 114, p. 846.

BOOK REVIEW

Technical Writing. By T. A. Rickard. 3rd Ed. *John Wiley and Sons*, New York. $2.00.

It seems that, not so long ago, the faculty of the University of California were rather unhappy over the "verbal brick laying" of the engineering students, so they asked Dr. Rickard, a mining engineer and a former editor of engineering journals, to do something about it. This excellent book presents the development and expansion of that original set of lectures, and it easily conveys the general impression that if listening to this teacher is as pleasant as reading his book, his classes must be a great joy to his students.

Dr. Rickard's style is delightfully breezy and informal. Any reader would be urged to read every word for fear of losing some of his rare comments, and the many good laughs that are tucked away in unsuspected places. He understands the unwritten pedagogical principle that a little good humor makes instruction easier for everybody and enables a teacher to inject practically any kind of knowledge into his students effectively and painlessly.

But underneath, he is seriously concerned over the poor English that is so commonly used by engineers in their reports and published articles. He considers technical language one of the engineer's finest instruments of precision, and deplores the shameful way it is abused. The chapters on *Naturalness*, *Construction*, *Composition*, and *Style* present all that is needed of the basic principles of good technical writing, without overburdening the text with rules; in fact, all these rules are boiled down to one: Remember the Reader. Other chapters reduce to simplest terms the problems of relative pronouns, verb moods, punctuation, and other little things that cause confusion, doubts, and difficulties for even the best of writers at times.

But *words*—how this man does love and respect words! With Flaubert, he stresses the importance of *le mot juste*, and proves that power of expression lies in the choice of words rather than in the mere number of words in one's vocabulary. The chapters on *Clearness*, *Precision*, *Slovenliness*, *Jargon*, and *The Wrong Word* abound in horrible examples from actual reports or published articles. Most of these are corrected within themselves; that is, by a thoughtful typographical arrangement that saves both space and time, the superfluous or wrong words are

printed in different type. It is both amusing and gratifying to see how the floweriness of jargon withers away; and how a murky fog of generalities or slovenly, cryptic journalese clears in the light of specific terms.

Apropos of all this: At a recent meeting of The Author's League, Dr. Glenn Frank, of the University of Wisconsin, said that in times of business depression writers are too often inclined to develop an inferiority complex from the thought that, in such times, deeds count for far more than words. He believes this to be a mistake; that words, powerful words, are needed more than ever in times of stress, doubt, and indecision, to mold public opinion, and to guide wavering minds into the channels of belief in new ideals. He especially urged those who understand the wonders of science and technology to explain them to others so that they will be properly appreciated; and he emphasized the need for good lucid writing on just these subjects.

Dr. Rickard seems to feel that it is rather hopeless to try to reform our contemporaries, and is content to do his bit for those who are still in school. It has been my observation and my editorial experience that many of our contemporaries could stand a fair amount of prodding and shaking up; and if it were my privilege to select a few good reference books, not alone for engineers but for all writers on technical subjects, this little volume on *Technical Writing* would be high on the list. Everyone—no matter how much he thinks he knows—who elects to explain the wonders of any branch of science and technology can learn something from this book.

This author generously invites constructive criticism and suggestions for improving the text in later editions. Lest I thus allow the mote to eclipse the beam for my brethren, I refrain from publishing my differences of opinion here. Some day I may write him a letter.

FLORENCE E. WALL

OUR AUTHORS

New Fields for Chemists

Chandler D. Ingersoll, F.A.I.C., studied an additional year in France on a fellowship after receiving his doctor's degree from Columbia. Returning to this country, he spent two years as research chemist with the du Pont Company, then became a sugar chemist, first with the Federal Sugar Refining Company, later with Spreckles. He is now with the United States Leather Company.

Tall and active, his service with the United States Navy still shows in his physical bearing. His intimates know him as a loyal but candid friend who is amiable without being pliable. Other chemists listen with interest to his definite ideas, expressed at the round table of The Chemists' Club.

Organic Chemical Research

J. N. Taylor, F.A.I.C., brings to his discussion a breadth of viewpoint acquired in nearly a quarter-century of experience in the government service, first in the laboratories of the Department of Agriculture, and now in the chemical and economic work of the Department of Commerce. This experience qualifies him to speak of the importance of research as regards both the chemical industry and the American people.

A chemist through and through, Dr. Taylor sometimes thinks wistfully of his days in the laboratory. He often feels an urge to break a few beakers or to get an end-point.

Reports in Advertising

Eugene F. Cayo, F.A.I.C., was born in California, attended the University of Washington, later studied accounting and the management of industrial enterprises at the Wharton School of the University of Pennsylvania.

Mr. Cayo's early chemical experience was in the cement industry and in pharmaceuticals. During the war he was with the gas defense division of the Chemical Warfare Service. He is now associated with Samuel Sadtler & Son, Inc., in experimental and development work as applied to industry.

For diversion Mr. Cayo likes hiking, sailing, riding, particularly if he can indulge his hobbies in the neighborhood of Puget Sound and the Cascade Mountains.

Herty Biographer

Florence E. Wall, F.A.I.C., has had varied experience in teaching, industrial chemistry, and writing. She has devoted several years to research, educational work, and technical publicity on cosmetics and beauty culture. Author of two books and many articles, she is considered one of the best writers on scientific and technical subjects for both scientific people and laymen.

One of the first women members of the Institute, Miss Wall has always been active in its affairs. She feels strongly that chemists, and especially teachers of chemistry, ought to have more professional homogeneity.

Miss Wall was editor of *The* CHEMIST from 1929 to 1931. Her hobbies are the piano, foreign languages, collecting old books.

Comment on Employment

Frank G. Breyer accepted a position with the New Jersey Zinc Company immediately after he was graduated from Johns Hopkins in 1908. He eventually became chief chemist of the company, and during the years 1918–27 he was director of research development. For the last five years he has been a member of the firm of Singmaster and Breyer, metallurgical and chemical engineers.

Mr. Breyer's work as executive secretary of the Committee of Unemployment and Relief is described in his article.

When he can get away for a few moments from his work and from aiding other chemists, Mr. Breyer likes to fish for bass in the St. Lawrence, where he owns an island.

Chemist by Intellectual Interest

Carl A. Nowak, F.A.I.C., is a consulting chemist and director of the Nowak Chemical Laboratories, St. Louis, Mo. His particular interest is in the brewing industry, a department of chemistry which he entered by the process described in his article. He is the author of

New Fields for Brewers, Non-Intoxicants, Manuscript Copy of Practical Methods, and *Modern Brewing*. He is editor and publisher of *The Brewer's Art*, a bi-monthly publication first issued in June, 1923.

Studious, creative, and imaginative, Mr. Nowak's chief hobby is photography, though he also likes teaching and writing.

"Occam and Atoms"

K. P. McElroy spent much of his chemical career in the agricultural department of the Bureau of Chemistry under Dr. Harvey Wiley, who considered him his right-hand man. Mr. McElroy finally turned patent attorney, which has been his occupation for the last twenty-five years.

The son of a newspaper editor, Mr. McElroy is known for his ability to express himself, a faculty which is still more important because it is combined with a sense of humor. During the summer he spends his time on a farm in Virginia, partly because he likes farming and partly because it is good for his health.

Russian Chemist and Executive

Leon G. Khvostovsky is chemical director of the Amtorg Trading Company. He was graduated as an engineer from Kieff Polytechnical Institute. After experience as builder and director of many industrial plants, he became representative in the United States of the chemical industries of the U. S. S. R. Mr. Khvostovsky is the editor of *American Engineering Industry*. He is a member of the American Chemical Society and is particularly interested in the organization and rationalization of industry.

Tall, distinguished-looking, Mr. Khvostovsky has had a many-sided education. His hobbies are music and motoring.

INSTITUTE NOTES

OFFICERS

National Council

The eighty-seventh meeting of the Council of The American Institute of Chemists was held at The Chemists' Club, on Thursday, January 14, 1932. President Dr. Frederick E. Breithut presided.

The following councilors and officers were present: Messrs. Grosvenor, Harold, Herstein, Neiman, Rogers, Sachs, and Zons.

In the absence of Mr. E. F. Cayo, Mr. Franklin D. Jones acted in his place at the meeting. Mr. Edward L. Gordy, editor of *The* CHEMIST, was also present.

The Secretary presented a letter from Howard W. Post, relative to the formation of a Buffalo Chemists' Club, which requested that someone representing the Institute address the members of the Club at a convenient date, in order to interest them in the Institute. It was suggested that Dr. Breithut make such an address if possible, and the matter was referred to the President and the Secretary.

Mr. Herstein reported that Dr. Van Doren, Chairman of the Committee on Constitutional Amendments, was out of the city, and that a detailed report would be submitted at the next meeting. An extended discussion was held relative to the suggested amendments to the Constitution, with the request that Mr. Herstein report this discussion to the Committee for its consideration.

The Committee on Nominations reported upon the names submitted by the Committee; and a number of additional names were suggested.

An extended discussion was held relative to the present qualifications for membership, and numerous suggestions were made for a change whereby the differences between the various classes of membership might be more evenly

divided. The matter was referred to the Committee on Constitutional Amendment.

A number of applicants were elected to membership.

The Secretary reported the membership as follows: Fellows, 511; Associates, 66; Juniors, 59; Honorary, 6; Life, 2. Total, 644.

HOWARD S. NEIMAN, *Secretary*

Washington Chapter

The Washington Chapter of the Institute has arranged to have National Councilor L. V. Redman, President of the A. C. S., as its speaker for the February meeting, which will take place on the 19th.

Dr. Redman will speak on "Chemistry and Currency."

Dr. Redman feels that "the chemist creates a great deal of hardship for himself by not understanding the effect which his own industry has in creating and destroying capital. The chemist is not sufficiently familiar with the swings of increased production and depression which often follow his efforts, and the more the chemist thinks in these terms and understands them, the more valuable will be his creative efforts."

The Washington Chemical Society (the local chapter of the A. C. S.) has accepted the invitation of the Washington Chapter of the Institute to make this a joint meeting. Preceding the meeting, there will be a dinner at the Cosmos Club in honor of Dr. Redman.

D. F. J. LYNCH, *Chairman*

New York Chapter

The January meeting of the Chapter was held at The Chemists' Club on the evening of January fifteenth. After the dinner, the program of the evening was opened by Mr. Frederick Kenney, chairman of the chapter. He introduced Mr. Frank G. Breyer of Singmaster & Breyer, who delivered an address entitled: "How Can Chemists and Chemical Engineers Be Consolidated as a Profession to Deal Effectively with the Present Unemployment Emergency?" Prior to his association with his present company, Mr. Breyer was with the New Jersey Zinc Company during a period of seventeen years. During ten of these years he was director of research and development. Because of experience as plant chemist, executive, and consultant, Mr. Breyer is possessed of a rather well-rounded appreciation of the chemist and his work.

Mr. Breyer was addressing the chapter in his capacity as executive secretary of the Committee on Unemployment and Relief for Chemists and Chemical Engineers. He told of the work this committee is doing, involving registration and employment assistance for those needing help during the present crisis. There is great need for securing complete registration, as only with this evidence in hand can the committee estimate the magnitude of its problem. Registration headquarters are being maintained in the basement floor of The Chemists' Club. Advertisements in the classified section of the *Times* and *Herald-Tribune*, inserted in the "Help Wanted—Male" columns, under the head: "Chemists and Chemical Engineers," are found effective in bringing the availability of the committee directly to the attention of those who need its assistance.

There was discussion from the floor by a number of members including Dr. Frederick Breithut, president of the Institute.

LEON V. QUIGLEY, *Secretary*

Pennsylvania Chapter

A regular meeting of the Chapter was held at the Engineers' Club on Tuesday evening, February 2nd. The speaker was Dr. William Seifriz, Professor of Botany at the University of Pennsylvania, who addressed the meeting on the subject of the status of the scientist in Russia.

Professor Seifriz toured Russia last summer, as well as several times previously, and numbers among his intimate friends some of the foremost Russian scientists. His address will be reported in greater detail in an early issue of *The* CHEMIST.

New Members

The following were elected to membership in the Institute at a meeting of the National Council held on January 14th:

FELLOWS

CHARLES BARBAN, Consulting Chemist and Chemical Engineer, 1133 Broadway, New York, N. Y.

JOHANNES SYBRANDT BUCK, Senior Organic Chemist, Burroughs Wellcome and Co., Inc., Expt. Research Laboratories, Tuckahoe, N. Y.

EPHRAIM FREEDMAN, Director, Bureau of Standards, R. H. Macy & Co., Inc., 34th Street and Broadway, New York, N. Y.

CHARLES W. RIVISE, Patent Attorney, 1321 Arch Street, Philadelphia, Pa.

JUNIOR

EVA RUTH HARTZLER, Student, Juniata College, Huntingdon, Pa.

Applications for Membership

FELLOWS

FRANK G. BREYER, Consulting Chemical and Metallurgical Engineer, 420 Lexington Avenue, New York, N. Y.

KARL G. H. M. MEISTER, Chemist, 125 Lake Avenue, Mariners' Harbor, Staten Island, N. Y.

ELSA R. ORENT, National Research Fellow in Bio-chemistry, 615 North Wolfe Street, Baltimore, Md.

ASSOCIATES

SAMUEL H. CULTER, Chief Analyst, Burroughs Wellcome & Co., Tuckahoe, N. Y.

EMIL DAVIDSON, Chemical Adviser, Pfaltz & Bauer, 300 Pearl Street, New York, N. Y.

JUNIOR

EDGAR DARE BOLINGER, Laboratory Assistant, Juniata College, Huntingdon, Pa.

The following member has applied for transfer from Associate to Fellow:

KIRBY E. JACKSON, 820 Eighteenth Avenue South, Nashville, Tenn.

NEWS

Arthur K. Johnson has resigned from the New York Research Laboratory of the Tubize Chatillion Corporation, and anticipates entering textile consulting practice.

Victor Le Gloahek, French chemical engineer, has arrived in New York to begin plans for a factory in San Diego, California, which will supply algin to American paper, textile, cement, and leather concerns. The algin will be extracted from seaweed by a new process which will reduce the cost to a tenth the former figure.

Photograph Proton

The Physical Review, published by the American Physical Society, contains a preliminary report of the successful photographing for the first time of the tracks of the hydrogen proton.

The report was submitted by M. A. Tuve, L. R. Hafsted, and O. Dahl of the Canadian Institute of Washington, the scientists whose 2,000,000-volt X-ray tube won for them the $1000 annual award of the American Association for the Advancement of Science.

Expansion at Columbia

Columbia University is planning a $20,000,000 engineering center, to be built with the idea of developing engineering scholars instead of mere practitioners.

The new engineering department will need additional laboratory facilities, as well as a site easily accessible by rail and water for research and testing laboratories.

Textile Institute Elects

Francis P. Garvan, president of the Chemical Foundation, has been elected president of the United States Institute for Textile Research.

Described as the "father of the American dye industry," Mr. Garvan has long been known as the champion of American chemistry. With his broad perspective he sees clearly the necessity for the "creation and support of a self-sustaining industry; back of this industry, well-equipped and heavily endowed educational institutions; back of these, stimulation in our youth of the creative spirit; and, behind it all, the sympathy and support of the people."

A. C. S. Meeting

The 83rd meeting of the American Chemical Society will be held in New Orleans, March 28th to April 1st.

The final program will be printed in the March 20th issue of the *News Edition* of *Industrial and Engineering Chemistry.*

Alcan Hirsch, F.A.I.C., has been appointed in a consulting capacity as chief engineer to the National Planning Bureau of the All-Union Chemical Industries of the U. S. S. R., with headquarters in Moscow.

Dr. Hirsch's duties will be supervisory and advisory. He will serve on the various commissions in connection with

their existing and projected chemical enterprises.

The Soviet Government has appropriated about 700 million dollars for capital investment in the chemical industries for the period ending 1933. They are also training thousands of industrial technicians for these industries.

Dr. Hirsch will sail in February for Moscow, spending a few weeks in Russia and then returning to the United States for a short stay, after which he will leave again for the Soviet Union.

Research Fellowships

The J. T. Baker Chemical Company announces two $1000 research fellowships in analytical chemistry. The fellowships will usually be awarded to students of analytical chemistry who have completed nearly all of their college work and who can devote practically their full time to their doctor's dissertation.

One fellowship will be awarded in the Eastern division, with N. Howell Furman of Princeton University, chairman of the committee on award; and one in the Midwestern division, with H. H. Willard of the University of Michigan, chairman of the committee.

Entertainment and Dance

The annual New Year's entertainment and dance of The Chemists' Club was held at the club house, 52 East 41st Street, New York, on the evening of Saturday, January 23rd.

A buffet supper was served at 7:00, with music for dancing from seven till twelve. Professor Delroy, psychologist, addressed the guests assembled in the lounge and was available afterward for individual character analysis.

Max Moller addressed the Kent Chemical Society on Tuesday, January 26th, on "A Chemist in Siam." Dr. Moller was instructor and head of the department of chemistry at the University of Bangkok for five years.

A meeting of the Oklahoma Section of the Petroleum Group was held at the University of Tulsa on January 16th, under the direction of **Harold M. Smith,** chairman.

Chemical Warfare Unit

A new Chemical Warfare Unit—the 306th Chemical Regiment, has been organized in the southwestern states. The first battalion is allocated to Texas, the second battalion to Oklahoma, and the third battalion to Colorado.

John J. Abel, an honorary member of the American Institute of Chemists, has been elected president of the American Association for the Advancement of Science.

The Society of Rheology held its third annual meeting in Rochester December 28th–30th. New officers elected were: president, Wheeler P. Davey; first vice-president, Earl E. Kraemer; second vice-president, F. E. Bartell; secretary, A. Stuart Hunter; treasurer, W. W. Buffum.

Edward R. Weidlein and **William A. Hamor,** of Mellon Institute of Industrial Research, have been appointed by Governor Pinchot to membership on the Greater Pennsylvania Council, which will be concerned with the development of agriculture, the industries, recreational facilities, and community welfare in the State. Mr. Hamor has also been made a member of the Council's executive committee

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The Manufacturing Chemists' Association held a series of meetings at The Chemists' Club during the week of January 25th.

Walter Dingley, formerly with the Pacific Coast Borax Company, has been elected secretary and treasurer of the United States Potash Company, 342 Madison Avenue, New York.

Erle G. Hill, formerly Associate Professor of Metallurgy in the School of Marines, University of Pittsburgh, has been appointed to a fellowship at the Mellon Institute under a grant from the Lukens Steel Company of Coatesville, Pennsylvania. He will investigate processes employed in manufacturing steel plates.

Public Relations Counsel

Leon V. Quigley has established his own business as counsel on public relations at 730 Fifth Avenue, New York.

During the past seven years Mr. Quigley, as technical editor of the Bakelite Corporation, has been director of public relations, publicity, and the educational program of this company. Under his direction the department developed gradually until it took a national place as a model for its kind of work in the technical industry. He is one of the very few technical publicists in the United States who has had experience in both engineering and literary work.

During his connection with the Bakelite Corporation he has become well known as a lecturer, appearing throughout the United States before such groups as the American Chemical Society, American Society of Mechanical Engi-

neers, Chambers of Commerce, and plant superintendents' associations. Judged by his published addresses before the New York Editorial Conference, he appears always to make it clear that public relations work is a specialized auxiliary of sales and advertising, cooperating in the increase of business and the building of company prestige and good will.